RESTRICTED CAMT 7-46

CANADIAN ARMY
MANUAL OF TRAINING

INFANTRY PLATOON WEAPONS

LAUNCHER ROCKET A tk
3.2 inch, CDN.,

(PROVISIONAL)

1956

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LAUNCHER ROCKET, A tk, 3·2 INCH, CDN

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LAUNCHER ROCKET, A tk, 3·2 INCH, CDN

INTRODUCTION

General

1. The 3·2-inch Launcher is intended to provide the platoon and equivalent sub units with an effective anti-tank weapon. It is a light, shoulder controlled, open tube, recoilless weapon. It can be fired in any of the normal rifle firing positions. The weapon is fired electrically by a small magneto which is operated when the trigger is pressed. Although primarily anti-tank, it can also be used against gun emplacements, pill boxes, houses, etc., and personnel.

2. The ordnance nomenclature for this weapon is Launcher Rocket, A tk, 3·2 inch, CDN.

Aim

3. The aim of this pamphlet is to provide the instructor with the knowledge required to teach the soldier how to maintain and use the Launcher Rocket, A tk, 3·2 inch, CDN effectively in battle.

Methods of Instruction

4. The principles are given in CATP 6-1 "Successful Instruction" Section 2 and in the pamphlet "The Principles and Practice of Good Instruction". These should be studied carefully by all instructors.

Safety

5. At the beginning of every lesson the instructor will inspect the weapon, container and drill rockets. Practice and HE rockets will never be used for instructional purposes.

Selection of Men

6. Men selected for training should possess good eyesight and intelligence. The rangefinder sight (coincidence type) employed with this weapon can be used efficiently by a high percentage of men. Men suffering from astigmatism should not be chosen. Crew members should be chosen from men who show special aptitude for the training during the Part I instruction.

Training

7. Training is broken down into three parts as follows:

Part 1: All trained infantry soldiers must know and be proficient in lessons 1 to 6 inclusive, and be capable of passing tests Nos 1, 2, 3 and 4 of the Tests of Elementary Training.

Part 2: All members of the launcher crew must know and be proficient in lessons 1 to 11 inclusive. They must pass all five of the Tests of Elementary Training.

Part 3: Instructors must know and be proficient in:

(*a*) Lessons 1 to 13 inclusive
(*b*) The training of soldiers on the launcher and rangefinder sight
(*c*) The testing of individual ability
(*d*) The preparation and maintenance of progress charts for recording individual ability.
(*e*) The safety precautions and temperature limitations.

8. Training should be carried out by progressive stages during which men who show no aptitude for using the rangefinder sight should be replaced. Careful records should be kept throughout in the form of progress charts to assess individual ability. Information pertaining to the training and testing of men is contained in Appendix "A" (Rangefinding Analysis).

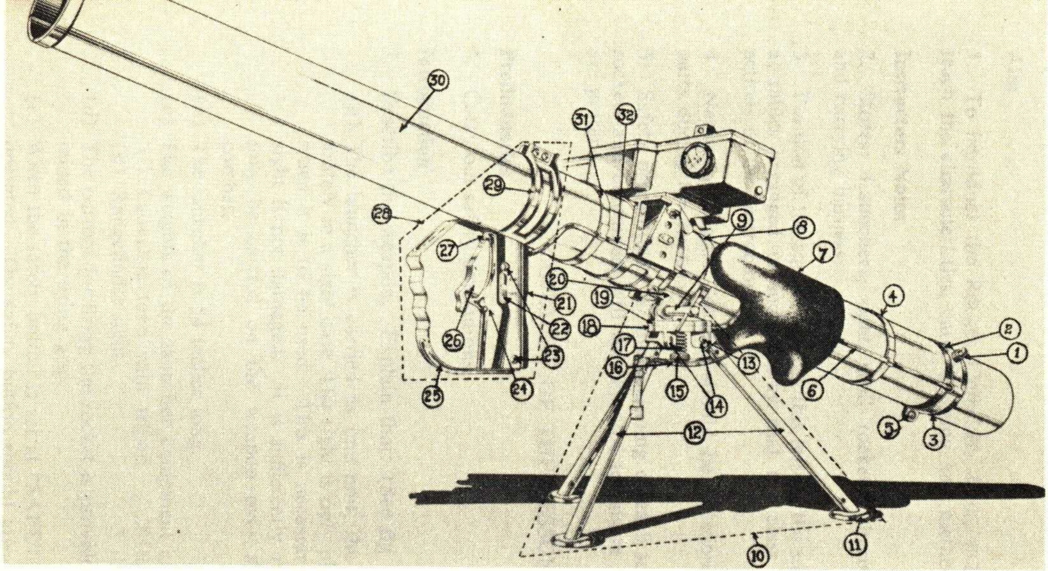


FIGURE 1—Launcher rocket, A tk, 3·2 inch, Cdn.

1 contact spring
2 contact spring assembly
3 insulation strip
4 contact lead supporting band
5 screw
6 contact lead wire assembly
7 shoulder-pad
8 retaining band tube to saddle
9 elevation locking pin
10 tripod assembly
11 spade
12 leg
13 leg hinge pin
14 retaining pin
15 traversing lock nut
16 leg closed retaining ring
17 spring
18 fixed plate
19 traversing plate
20 saddle
21 left hand grip
22 safety button
23 screw
24 electric firing mechanism
25 firing mechanism support
26 trigger
27 right hand grip
28 electric firing mech support assembly
29 band teflon (plastic)
30 tube
31 contact lead supporting band
32 contact lead wire assembly

LESSON 1—INTRODUCTION, CARE AND CLEANING

Aim

1. To introduce the Rocket Launcher, A tk, 3·2 inch, CDN and to teach the characteristics, care, cleaning and methods of carriage.

Instructors Notes

2. Stores: Launchers, sight, drill rockets, charts, cleaning material, and carrying harness.

3. Position of the squad: During this lesson, the squad should be seated at tables arranged in such a way that the class can observe all the actions of the instructor.

4. Naming of parts: Soldiers should be questioned on the names of parts during the lesson.

5. Safety precautions: At the beginning of each lesson, launchers, drill rockets and containers will be inspected to ensure that NO live rockets are present.

CONDUCT OF THE LESSON

Preliminaries

6. Carry out safety precautions.

Introduction

7. Describe the weapon. Explain that: (See fig 1)

(*a*) The launcher is carried as one unit; the sight is carried separately in a sight case. The sight is only placed on the launcher when it is to be used. This is necessary to ensure that the sight is not damaged. It is sufficiently rugged though that it may be carried on the weapon over short distance during combat.

(*b*) The launcher is 54 inches long.

(*c*) The weights of the launcher equipment are:

(i)	Launcher tube with tripod	28½lbs approximately
(ii)	Rangefinder sight	5 lbs approximately

(*d*) The current for firing the rocket is provided by a magneto contained in the firing grip.

(*e*) When the safety button is set at "SAFE" the trigger cannot be operated. The safety button should always be set at "SAFE" when the launcher is not being fired.

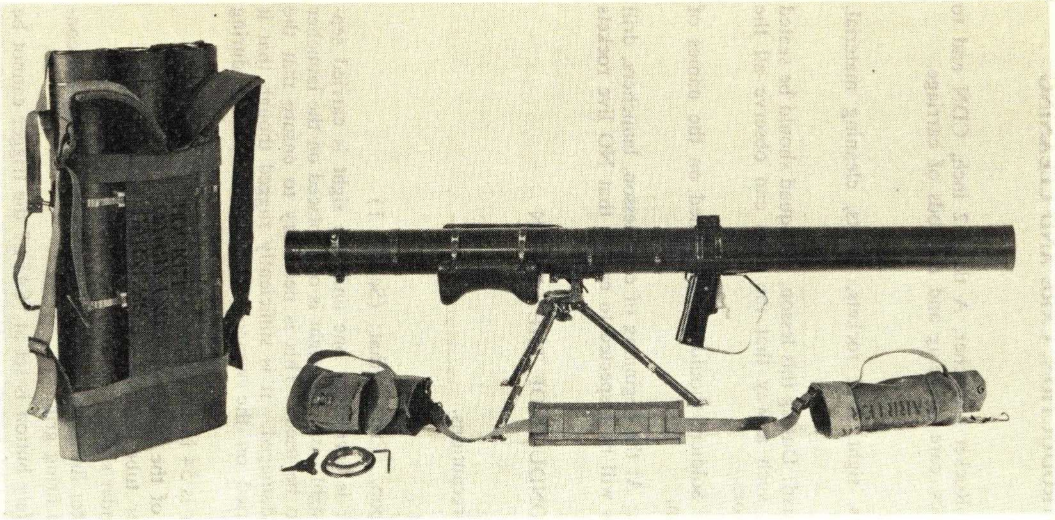


Figure 2—Launcher and equipment

1 launcher
2 launcher carrying harness
3 boresighting equipment
4 rocket container carrying harness
5 rocket container

(*f*) There is no recoil.

(*g*) There is a definite backblast extending to a depth of approximately 40 yards in rear of the launcher.

(*h*) The HE A tk rocket will penetrate over 11 inches of homogeneous armour at normal (90°) and approximately 5 inches at a 64° angle of strike.

(*j*) The maximum range of the rocket is 2,860 yards.

(*k*) Opening range will be 300 yards which assures a first round hit. The maximum effective range of the launcher is 450 yards.

(*l*) The muzzle velocity is 715 feet per second.

(*m*) The maximum rate of fire is 5 rounds per minute.

8. Question the squad.

Care and Cleaning

9. Explain that in order to maintain the launcher in serviceable condition the following cleaning will be carried out:

(*a*) Daily (or normal) cleaning.

(*b*) Cleaning before firing.

(*c*) Cleaning after firing.

Daily Cleaning

10. Explain and demonstrate the sequence and method of daily cleaning:

(*a*) Run a dry cloth through the tube until the inside of the tube is clean and dry.

(*b*) Apply a light film of oil to the inside of the tube by means of an oily cloth.

(*c*) Wipe the outside of the launcher clean of all dirt and moisture.

Cleaning Before Firing

11. Explain and demonstrate the sequence and method of cleaning before firing:

(*a*) Run a clean cloth through the tube until all oil has been removed.

(*b*) Wipe the sight mount clean of all dirt.

Cleaning After Firing

12. Explain and demonstrate the sequence and method of cleaning after firing:

(*a*) Clean the inside of the tube with the brush provided.

(*b*) Apply a light film of oil to the inside of the tube by means of an oily cloth.

(*c*) Repeat (*a*) and (*b*) for a period of three days.

NOTE

The sight must be wiped dry before returning it to its case. No attempt should be made to polish the sight lens. They must be wiped periodically with a dry, soft cloth.

13. Question the squad on daily cleaning, cleaning before firing and cleaning after firing.

Carriage of the Launcher and Rockets

14. Explain and demonstrate the methods of carrying the launcher and rockets. The sight will normally be carried in a case which can be slung over the shoulder across the body.

Conclusion

15. Questions from and to the squad.

16. Sum up.

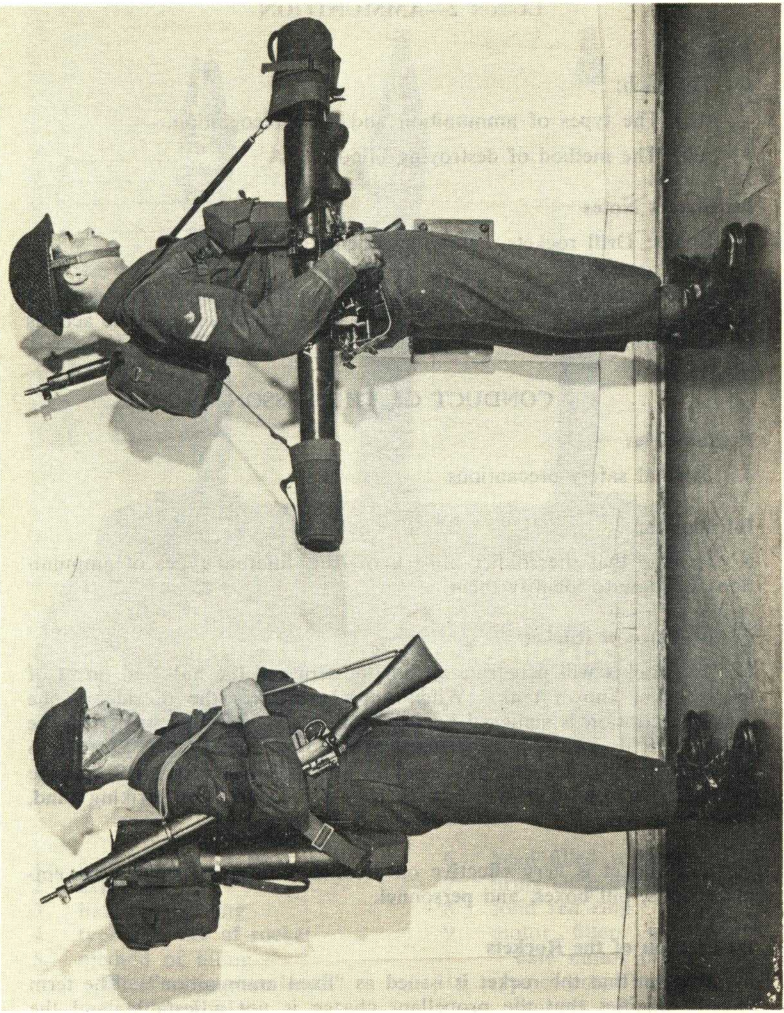


FIGURE 3—Carriage of Launcher and Ammunition

Note: the sight will be carried in a case which can be slung over the right shoulder across the body.

LESSON 2—AMMUNITION

Aim

1. To teach:

   (*a*) The types of ammunition and their recognition.

   (*b*) The method of destroying blinds.

Instructors Notes

2. Stores: Drill rockets, charts, and demolition kit.

3. Position of the squad: During this lesson, the squad should be seated at tables arranged in such a way that the class can observe all the actions of the instructor.

CONDUCT OF THE LESSON

Preliminaries

4. Normal safety precautions.

Introduction

5. Explain that the soldier must know the different types of ammunition and how to identify them.

Performance of Rocket

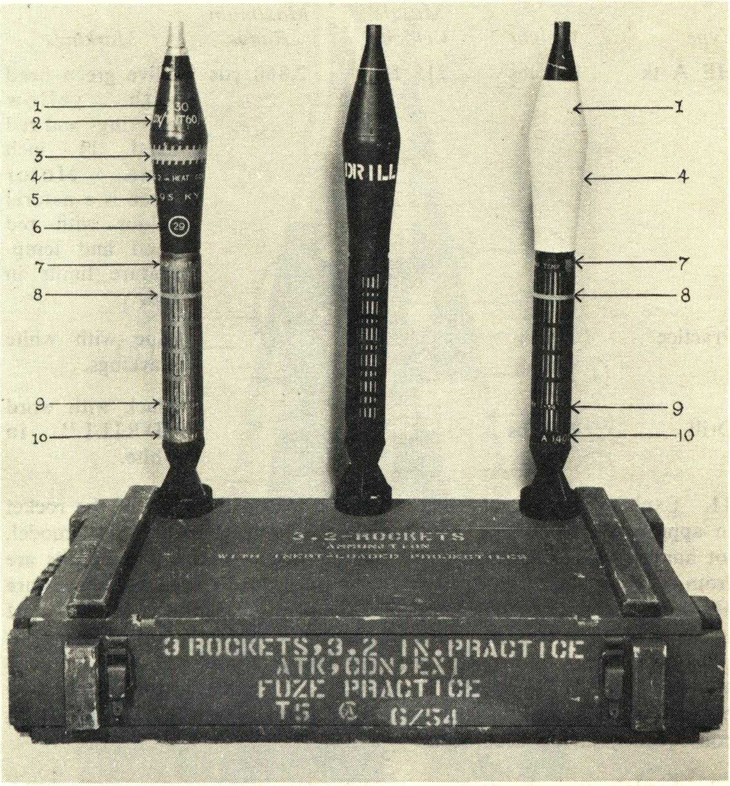
6. The rocket will penetrate all but the front of the hull and turret of the heaviest known tank. When a rocket strikes the outside of the tank, penetration is achieved by the action of a high velocity jet on the armour. This jet of burning gases and molten metal is projected into the tank, and besides causing casualties to its crew, it may set fire to the fuel and ammunition. The rocket may not explode on striking sand, mud or water.

7. The rocket is very effective on secondary targets such as gun emplacements, pill boxes, and personnel.

Description of the Rockets

8. Explain that the rocket is issued as "fixed ammunition". The term "fixed" signifies that the propellant charge is not adjustable, and the rocket is loaded into the launcher as a single unit.

9. There are three types of rockets.


1
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DRILL
29
A 140
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10
3.2-ROCKETS
3 ROCKETS, 3.2 IN. PRACTICE
ATK, GDN, EX1
FUZE PRACTICE
TS 6/54

FIGURE 4—Ammunition

1 ammunition lot no
2 explosive
3 hatched red ring
4 type and size of rocket
5 method of filling—fillers monogram head-date head filled

6 head filled series no
7 firing temp limits
8 solid red ring
9 motor fillers monogram-date motor filled
10 type of propellant—propellant lot no

Type	*Weight*	*Muzzle Velocity*	*Maximum Range*	*Markings*
HE A tk	8·5 lbs	715 fps	2,860 yds	Olive green head with yellow markings and red band 1½ inch wide. Motor Tube is a natural colour with red band and temperature limits in red.
Practice	"	"	"	Blue with white markings.
Drill	7·5 lbs	"	"	Black with word "DRILL" in white.

11. Explain that the markings are stencilled on the head of the rocket in appropriate colours. They include the type of rocket, size, model, lot number and date of loading. **Safe propellant temperature limits are from 0° F. to plus 120° F. The rocket must not be fired in temperature above or below those indicated.** The temperature of the propellant must be determined accurately, particularly in the lower limits of this temperature range. At temperatures between 0° F and 45° F and especially between 30° F and 45° F a slight (2°) change in the temperature of the propellant has a marked effect on the muzzle velocity which consequently affects accuracy.

12. Explain that the rockets are packed in the individual containers. Three single containers are strapped together with a carrying handle and packed as one unit in a wooden box. The exterior of the containers are marked to indicate the type of rockets in the containers. The wooden boxes have coloured markings in yellow, to indicate their contents.

Fuze CDN No. 1 PD Ex 2

13. Explain that a safety wire passes through the body of the fuze and the set back pin, thereby locking all moveable parts in their original safe position, (Fig. 5). The safety wire must be removed before loading. The fuze is classified as bore-safe, and is not fully armed until the rocket leaves the muzzle of the launcher.

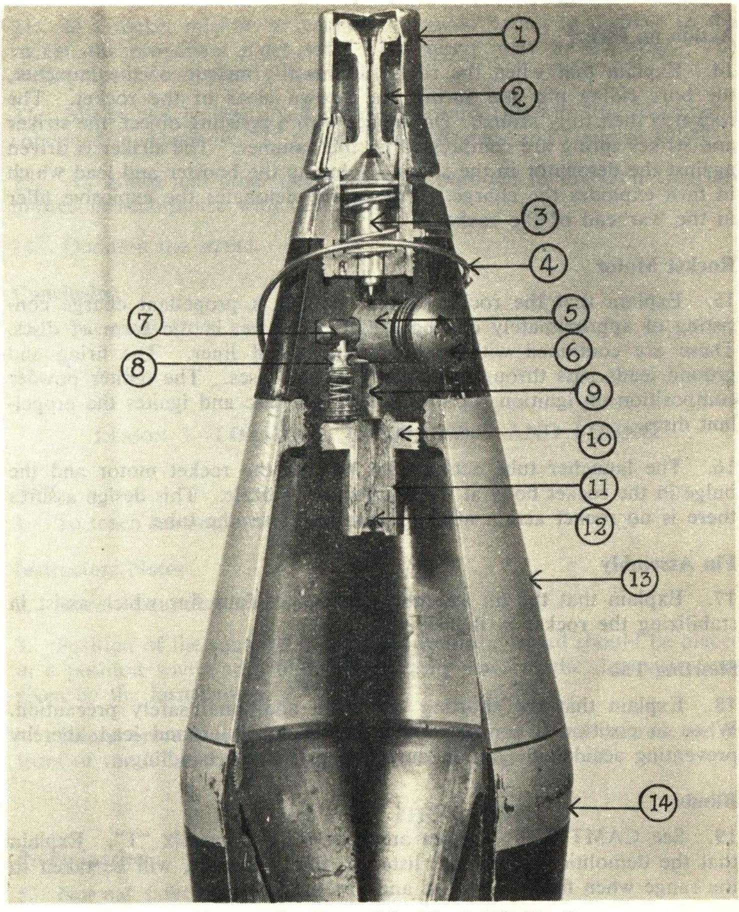


FIGURE 5—Fuze Cdn No 1 PD Ex 2

1	sealing cap
2	hammer
3	striker and spring
4	safety wire
5	slider
6	slider plug and spring
7	bore riding pin
8	set-back pin and spring
9	booster cartridge
10	booster housing
11	booster liner
12	booster lead
13	ballistic cap
14	warhead

Action on Firing

14. Explain that when the rocket leaves the muzzle of the launcher, the bore riding pin and spring are thrown clear of the rocket. The rocket is then fully armed. On impact with a resisting object, the striker and striker spring are compressed by the hammer. The striker is driven against the detonator in the slider, exploding the booster and lead which in turn explodes the charge. The charge detonates the explosive filler in the warhead of the rocket.

Rocket Motor

15. Explain that the rocket motor contains a propellant charge consisting of approximately one pound of explosive, in the form of discs. These are contained within an aluminum foil liner. The firing and ground leads pass through the centre of the discs. The igniter powder composition on ignition ruptures a blow-out disc and ignites the propellant discs.

16. The launcher tube acts as the wall of the rocket motor and the bulge in the rocket body at the fins forms a nozzle. This design assures there is no rocket action after the rocket leaves the tube.

Fin Assembly

17. Explain that the fin assembly consists of four fins which assist in stabilizing the rocket in flight.

Shorting Tab

18. Explain that the shorting tab is an additional safety precaution. When in position it connects the firing lead and ground lead, thereby preventing accidental ignition during shipping and handling.

Blinds

19. See CAMT 7-40 “Ranges and Courses”, Appendix “T”. Explain that the demolition equipment listed in this Appendix, will be taken to the range when firing HE A tk and practice rockets.

20. A blind is:

(*a*) A HE A tk rocket that leaves or partially leaves the launcher, but fails to explode.

(*b*) A HE A tk or practice rocket that:

- (i) Cannot be loaded into the launcher because of some defect in the rocket.
- (ii) Fails to fire, ie, a misfire.

21. If a rocket misfires or cannot be loaded owing to damage to the rocket, the propellant must not be interferred with in any way. The rocket must be completely destroyed.

22. Blinds will be destroyed in exact accordance with the instruction contained in Appendix "T" CAMT 7-40 "Ranges and Courses 1954".

23. All blinds and other defects will be reported to the Unit Quarter-masted in accordance with CAO 18-2.

24. Question the squad.

Conclusion

25. Questions from and to the squad.

26. Sum up.

LESSON 3—LOADING, UNLOADING AND FIRING

Aim

1. To teach loading, unloading and firing.

Instructors Notes

2. Stores: Launcher and drill rockets.

3. Position of the squad: During this lesson the squad should be placed in a position where the soldiers can easily observe the demonstrations given by the instructor.

4. Safety precautions: Do not allow anyone to stand in rear or in front of the launcher when it is loaded.

CONDUCT OF THE LESSON

Preliminaries

5. Normal safety precautions.

Revision

6. Ammunition (lesson 2).

Introduction

7. Explain that the methods of loading, firing and unloading are the same from all positions of firing and whether fired in the open or from behind cover.

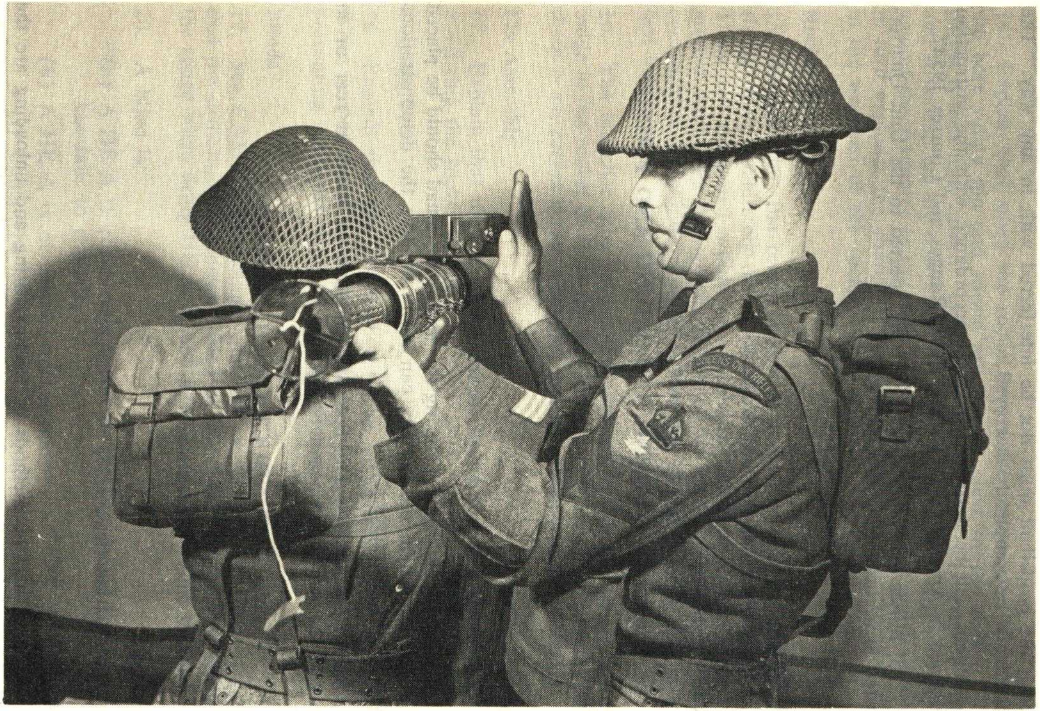


FIGURE 6—Loading the rocket

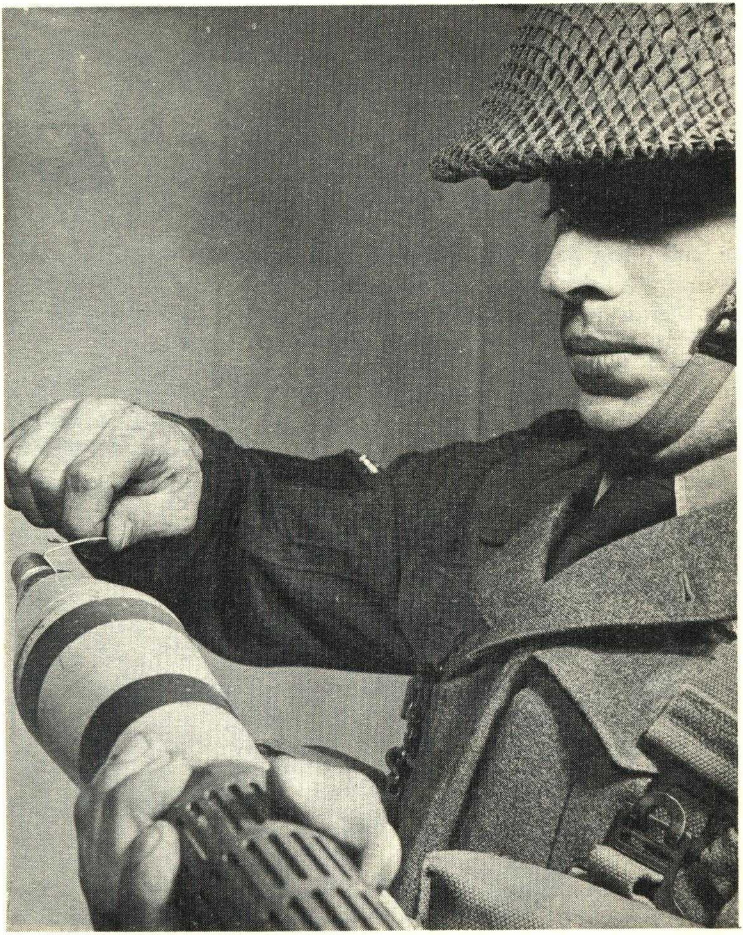


FIGURE 7—Removing the safety wire

Loading and firing

8. Explain and demonstrate the sequence and method of loading a launcher.

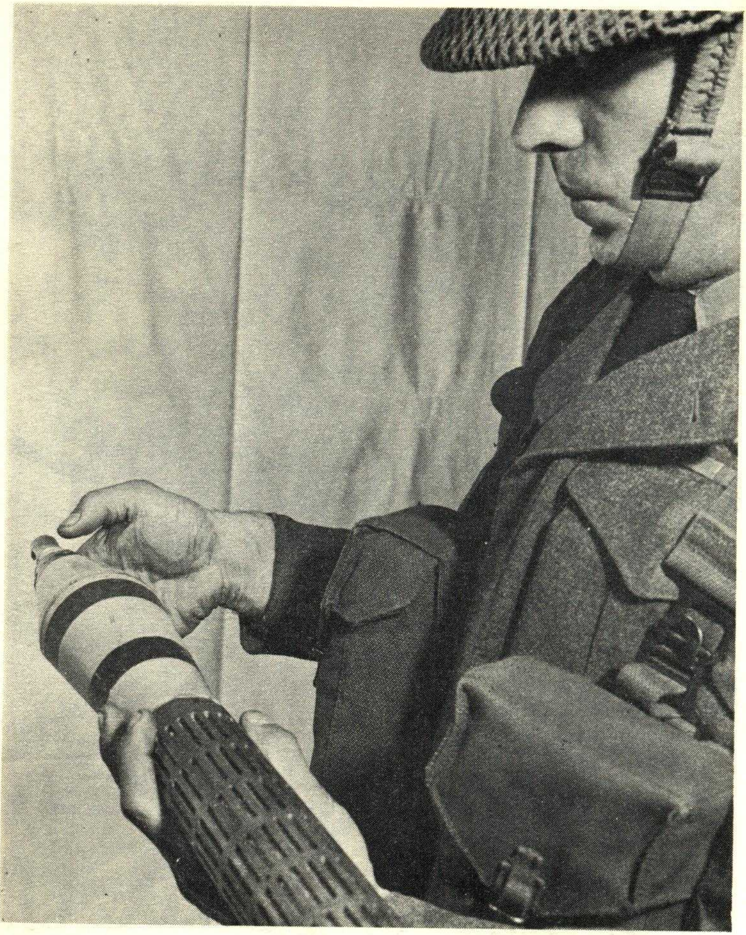


FIGURE 8—Testing the bore riding pin

9. Actions of the firer when he decides to load or is given the command "LOAD":

(*a*) Set the safety button to "SAFE".

(*b*) Tap the loader and order "LOAD".

(*c*) Place his right hand up along the side of the launcher and in rear of sight mount to avoid an chance of the trigger being pressed during loading. Do not rest the hand on the tube (Fig 6).

10. Actions of the loader:

(*a*) Tap the firer and repeat the order "LOAD".

(*b*) Hold the rocket with the left hand underneath and rocket head pointing towards the target.

(*c*) Remove the safety wire with the right hand and retain it (Fig 7).

(*d*) Test the bore riding pin to ensure that it is in position (Fig 8). If it is not in position, the rocket must be treated as a blind, removed immediately and carefully to a position at least 100 yards from any personnel for disposal.

(*e*) Pull out the shorting tab and firing lead with the right hand (Fig 9).

(*f*) Check the back blast area for clearance.

(*g*) Slide the head of the rocket into the launcher and push it fully home (Fig. 10).

(*h*) Hook the shorting tab onto the contact spring (Fig 11).

(*j*) Tap the firer and call "READY".

(*f*) Observe strike of rocket.

11. The firer will tap the loader and repeat the command "READY". He will then return his right hand to the firing grip, set the safety button to "FIRE" and aim. He will then:

(*a*) Operate the trigger by a squeezing action of the first two fingers of the right hand.

(*b*) Maintain the correct sight picture until the rocket leaves the muzzle.

(*c*) Watch the strike of the rocket through the sight.

(*d*) After the rocket has struck, tap the loader and order "LOAD".

(*e*) The loader will tap the firer and repeat "LOAD". He will then load another rocket.

Unload

12. Explain and demonstrate the sequence and method for unloading the launcher when no attempt has been made to fire.

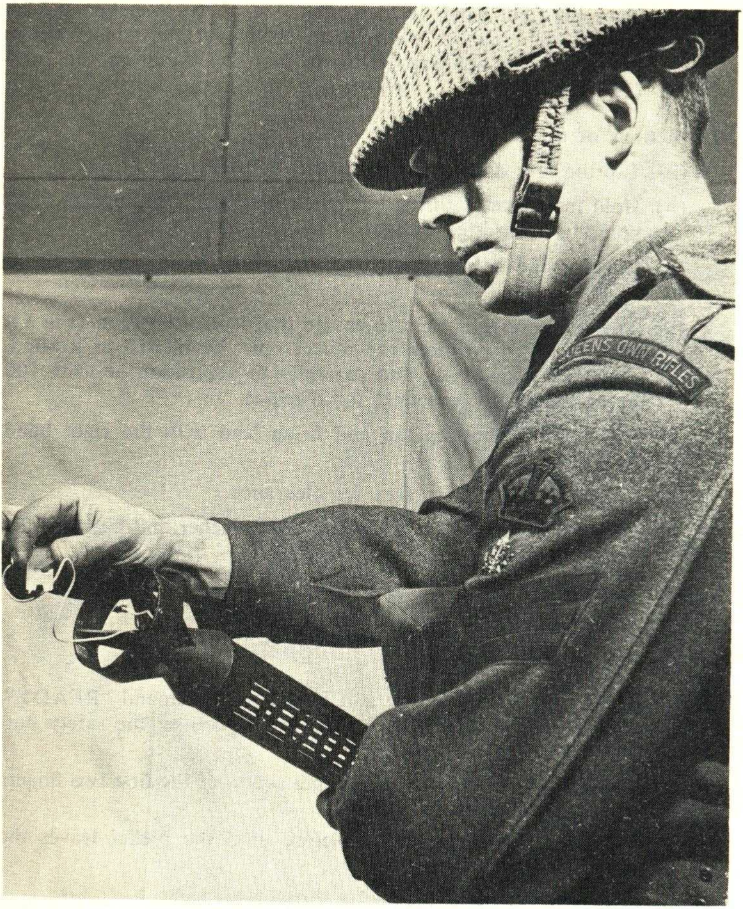


FIGURE 9—Pulling out the shorting tab and firing lead

13. *Action of the firer:*
    - (*a*) Set the safety button to "SAFE".
    - (*b*) Tap the loader and order "UNLOAD".
    - (*c*) Place the right hand up along the side of the launcher.

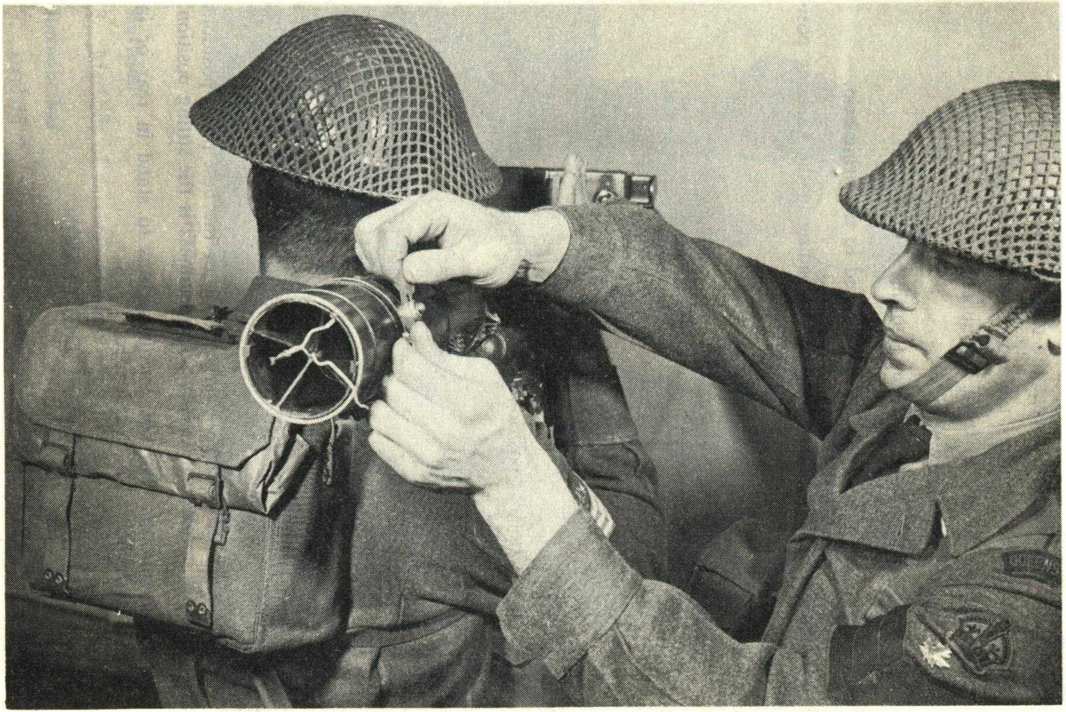


FIGURE 10—Hooking the shorting tab to the contact spring

14. *Action of the loader:*

    (*a*) Tap the firer and repeat the order "UNLOAD".

    (*b*) Unhook the shorting tab from the contact spring.

    (*c*) Remove the rocket from the launcher.

    (*d*) Replace the safety wire.

    (*e*) Replace the firing lead and shorting tab.

15. The firer will then return his right hand to the firing grip.

16. Practice the squad in loading and unloading in the kneeling positions.

Conclusion

17. Questions from and to the squad.

18. Sum up.

Lesson 4—FIRING POSITIONS

Aim

1. To teach the normal positions from which the Launcher is fired.

Instructors Notes

2. Stores: Launchers.

3. Position of the squad: During this lesson the squad should be placed in a position where the soldiers can easily observe the demonstrations given by the instructor.

4. Whenever possible this period will be taught outdoors in an area that affords various types of cover. The positions will be adopted using the various conditions of cover.

5. When firing against moving targets, one of the best firing positions which combines comfort, flexibility and steadiness is the sitting position.

6. Safety precautions: Do not permit persons to stand in rear or in front of the launcher when it is loaded.

CONDUCT OF THE LESSON

Preliminaries

7. Normal safety precautions.

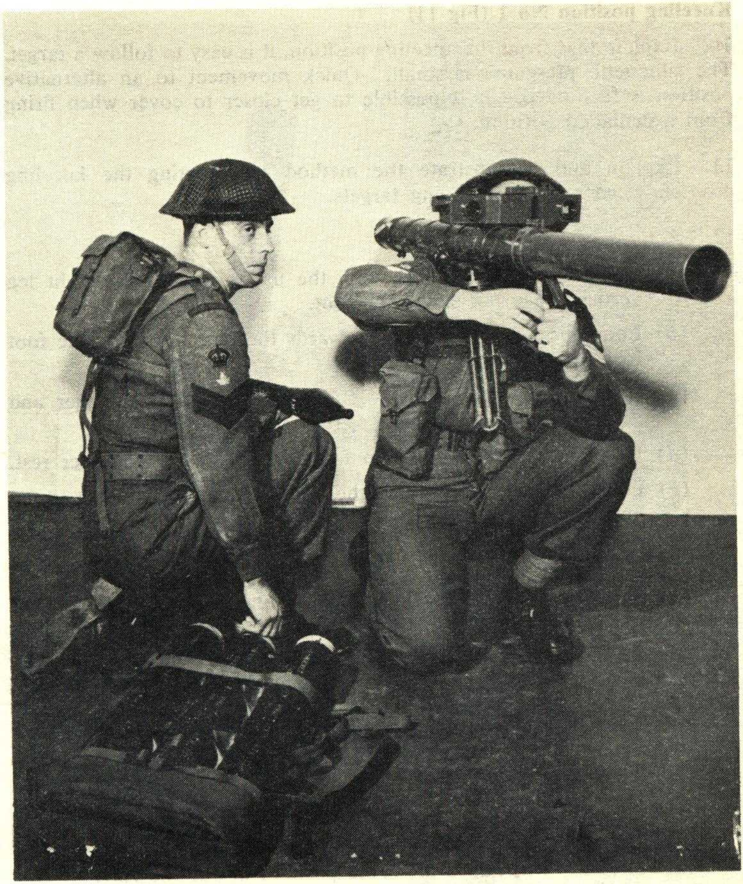


FIGURE 11—Kneeling position

Revision

8. Methods of carriage (Lesson 1).

Introduction

9. Explain that the positions adopted for firing is largely limited by the ground.

Kneeling position No 1 (Fig 11)

10. Explain that from the kneeling position, it is easy to follow a target. The silhouette presented is small. Quick movement to an alternative position is facilitated. It is possible to get closer to cover when firing from a defiladed position.

11. Explain and demonstrate the method of adopting the kneeling position when engaging moving targets.

12. Actions of the firer:

(*a*) Kneel on the right knee with the upper part of the right leg vertical. Do not sit on the foot.

(*b*) Point the left leg and foot towards the target keeping the foot forward of the right knee.

(*c*) Hold the body erect with left elbow under the launcher and the upper part of the arm against the chest.

(*d*) Hold the right elbow up to form a bed for the shoulder rest.

(*e*) Level the sight by bringing the line in the sight graticule to the horizontal.

13. Actions of the loader:

(*a*) Kneel on the left knee or both knees and square to the launcher opposite the firer's right shoulder.

(*b*) Keep close to the launcher in order to be able to load, communicate with the firer and assist in observation of fire.

(*c*) Conform to the movement of the firer.

Kneeling position No 2

14. Explain and demonstrate the method of adopting the kneeling position when engaging stationary targets:

(*a*) The firer will adopt the same position as for the rifle.

(*b*) The loader will adopt the same position as in kneeling position No 1.

15. Practise the squad at adopting the kneeling positions.

Sitting position No 1 (Fig. 12)

16. Explain and demonstrate the method of adopting the sitting position when engaging moving targets.

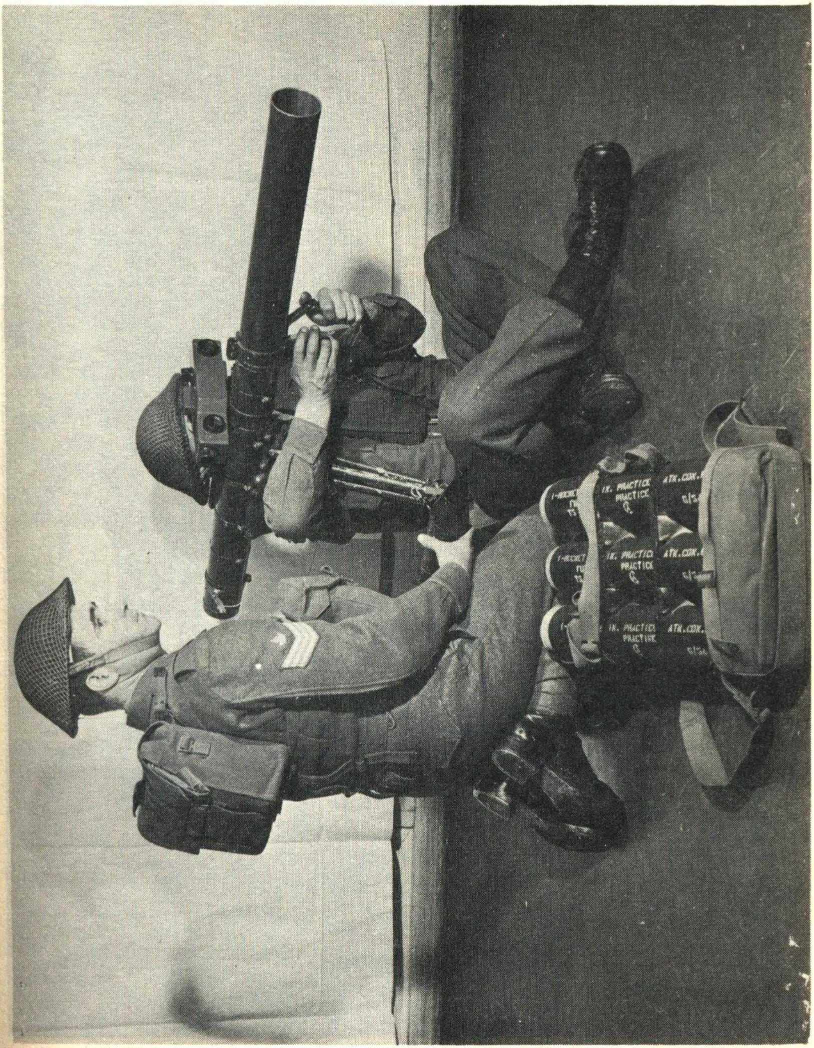


FIGURE 12—Sitting position no 1

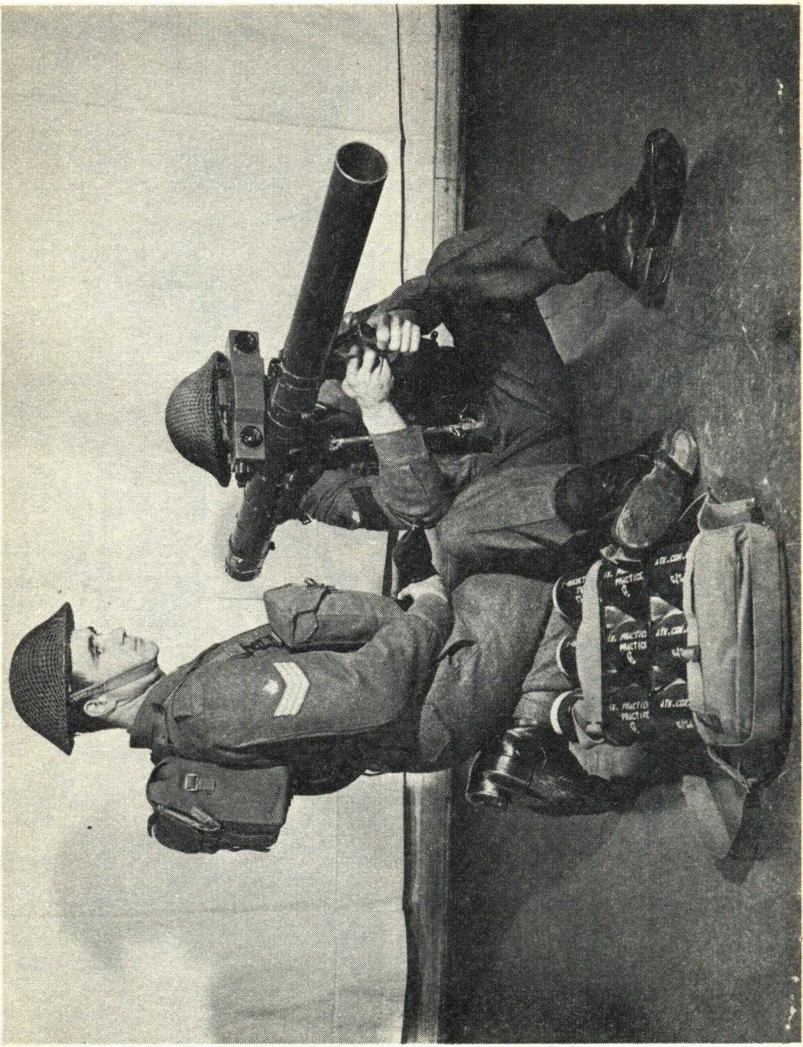


FIGURE 13—Sitting position no 2

17. Actions of the firer:
    - (*a*) Sit down facing half right to the target and cross the legs.
    - (*b*) Lean the body slightly forward from the hips and keep the back straight.
    - (*c*) Keep both elbows off the knees.
    - (*d*) Place the left elbow under the launcher with the upper arm against the chest.
    - (*e*) Keep the right elbow well up to form a pocket.
    - (*f*) Level the sight.

18. Actions of the loader:
    - (*a*) Kneel on the left knee or both knees, square to the launcher and opposite the firer's right shoulder.
    - (*b*) Keep close to the launcher in order to be able to load, communicate with the firer and assist in observation of fire.
    - (*c*) Conform to the movements of the firer.

Sitting Position No 2 (Fig 13)

19. Explain and demonstrate the method of adopting the sitting position when engaging stationary targets:
    - (*a*) The position of the firer is basically the same except that the feet are apart and both elbows are rested on the knees.
    - (*b*) The loader will adopt the same position as in sitting position No 1.

20. Practise the squad in loading and unloading in the sitting positions.

Standing Position

21. Explain that the standing position is normally used when firing from high cover, a trench or emplacement.

22. Explain and demonstrate the method of adopting the standing position.

23. Actions of the firer:
    - (*a*) Stand half right to the target, evenly balanced and both feet apart.
    - (*b*) Hold the launcher as in kneeling position No 1.

24. Actions of the loader:
    - (*a*) Stand facing square to the launcher opposite the firer's right shoulder.

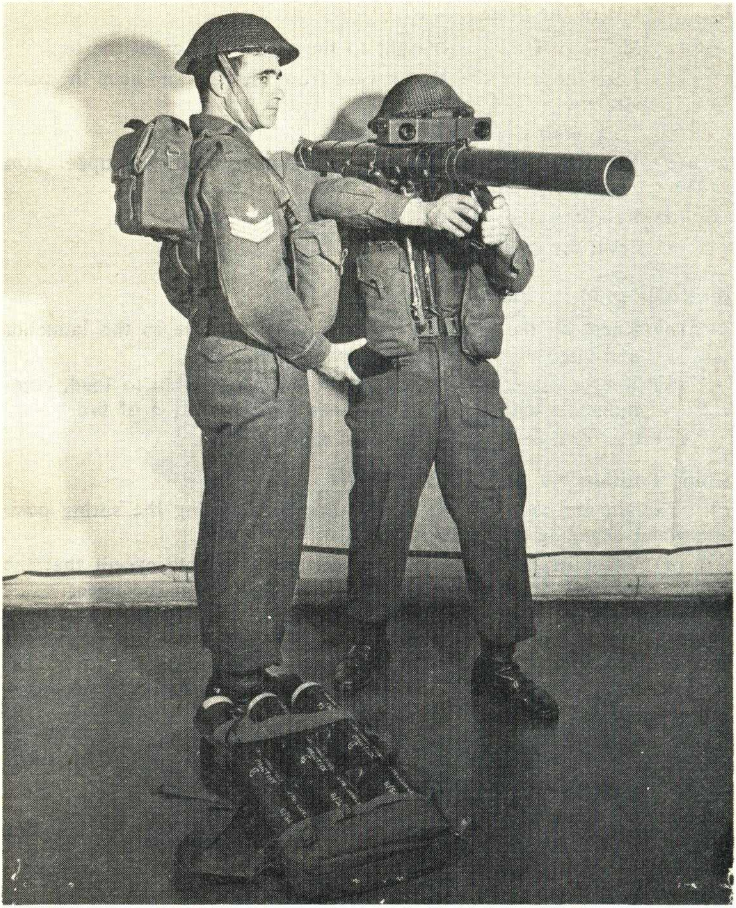


FIGURE 14—Standing position

(*b*) Keep close to the launcher in order to be able to load, communicate with the firer and assist in observation of fire.

(*c*) Conform to the movements of the firer.

25. Practise the squad in loading and unloading in the standing position.

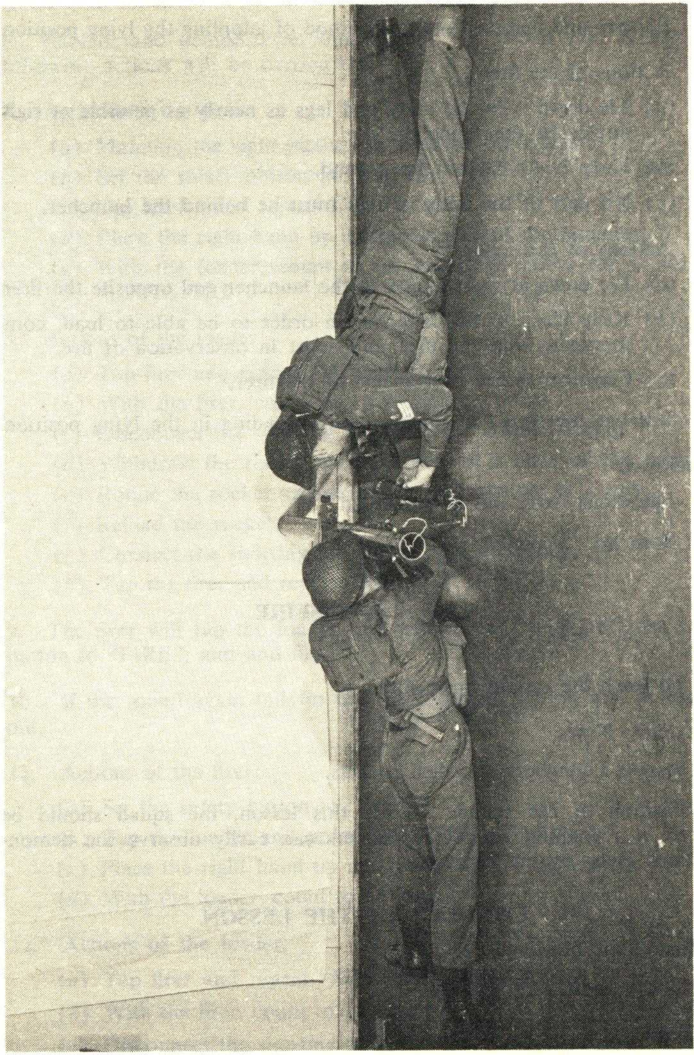


FIGURE 15—Lying position

Lying Position (Fig 15)

26. Explain and demonstrate the method of adopting the lying position.

27. Actions of the firer:
    - (*a*) Lie down with the body and legs as nearly as possible at right angles to the launcher.
    - (*b*) Keep heels flat on the ground.
    - (*c*) No part of the body or legs must be behind the launcher.

28. Actions of the loader:
    - (*a*) Lie down at right angles to the launcher and opposite the firer.
    - (*b*) Keep close to the launcher in order to be able to load, communicate with the firer and assist in observation of fire.
    - (*c*) Conform to the movements of the firer.

29. Practise the squad in loading and unloading in the lying position.

Conclusion

30. Questions from and to the squad.

31. Sum up.

LESSON 5—**MISFIRE**

Aim

1. To teach the actions on misfire.

Instructors Notes

2. Stores: Launchers and dirll rockets.

3. Position of the squad: During this lesson, the squad should be placed in a position where the soldiers can easily observe the demonstrations given by the instructor.

CONDUCT OF THE LESSON

Preliminaries

4. Normal safety precautions.

Revision

5. Loading, firing, and unloading.

Actions on Misfire

6. Explain and demonstrate, that should the rocket fail to fire, the following actions will be carried out.

7. Actions of the firer:

   (*a*) Maintain the sight picture and release the trigger.
   (*b*) Set the safety button at "SAFE".
   (*c*) Tap loader and report "MISFIRE".
   (*d*) Place the right hand up along the side of the launcher.
   (*e*) With the loader, count to 15 loudly to allow for a possible "HANGFIRE".

8. Actions of the loader:

   (*a*) Tap firer and repeat "MISFIRE".
   (*b*) With the firer, count to 15 loudly.
   (*c*) Disconnect the shorting tab from the contact spring.
   (*d*) Withdraw the rocket until the shroud is clear of the launcher.
   (*e*) Rotate the rocket approximately one quarter of a turn.
   (*f*) Reload the rocket.
   (*g*) Connect the shorting tab to the contact spring.
   (*h*) Tap the firer and report "READY".

9. The firer will tap the loader and will repeat "READY", set safety button to "FIRE", aim and fire.

10. If the round again fails to fire the following action will be carried out.

11. Actions of the firer:

   (*a*) Set the safety button to "SAFE".
   (*b*) Tap the loader and order "MISFIRE—UNLOAD".
   (*c*) Place the right hand up along the side of the launcher.
   (*d*) With the loader, count to 15 loudly.

12. Actions of the loader:

   (*a*) Tap firer and repeat "MISFIRE—UNLOAD".
   (*b*) With the firer, count to 15 loudly.
   (*c*) Disconnect the shorting tab from the contact spring.
   (*d*) Withdraw the rocket and replace the safety wire.

(*e*) The shorting tab will not be replaced in order that the misfire may be recognized and not reloaded by mistake.

(*f*) Place the rocket aside at a distance of at least 15 feet from any personnel. The rocket will be disposed of on completion of firing. Reload a new rocket, tap the firer and order "READY".

13. The firer repeats the command "READY", sets safety button to "FIRE" aims and fires.

14. Explain that the actions taught are necessary for absolute safety when firing on ranges under peace-time conditions. In action the firer must decide whether any of these precautions may be omitted. He will be guided by the range to the enemy tank, and the urgency of the situation.

15. Practise the squad in actions on misfire.

Conclusion

16. Questions from and to the squad.

17. Sum up.

LESSON 6—AIMING

Aim

1. To teach aiming at stationary and moving targets.

Instructors Notes

2. Stores: Sights, sight stands or launchers, charts, tank photographs.

3. Position of the squad: During this lesson, the squad should be seated at tables and arranged in such a way that the class can observe all the actions of the instructor.

4. Use sight chart, or sight and tank photos to show aiming procedure and correct aim.

5. Although the lesson is designed to be taught in one period, further practice is required on stationary and moving targets to make the student proficient in aiming and in estimation of speeds.

6. The large horizontal line in the field of view is graduated by four small vertical lines on either side of the centre marker. Each division corresponds to a speed of 5 miles per hour. Therefore, the maximum speed allowed for is 20 miles per hour for a direct crosser.

CONDUCT OF THE LESSON

Preliminaries

7. Normal safety precautions if launcher is used instead of sight stands.

Introduction

8. Explain that the firer does not need to know the range to the target. He merely obtains coincidence on his target, aims and fires.

Stationary Target

9. Explain and demonstrate the following sequence and method of laying a correct aim on a stationary target:

(*a*) Locate the target in the centre of the field of view. Two images of the target will probably appear (Fig 16).

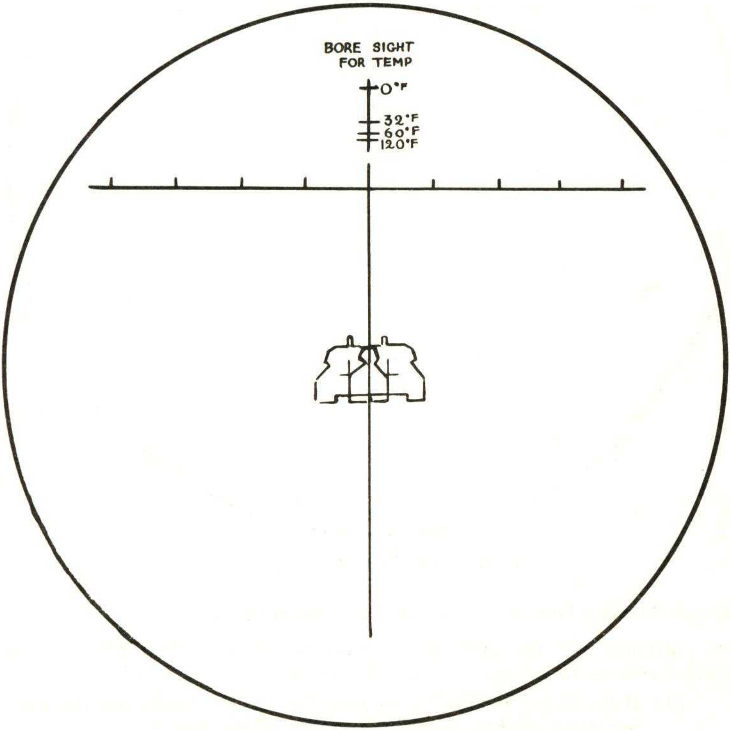


FIGURE 16—Aiming—two images

(*b*) Turn the control mechanism knob and bring the two images together so that they merge into one (Fig 17).

(*c*) Move the weapon until the point of intersection of the long horizontal and vertical lines in the object glass coincide with the desired point of strike on the target. Fig 18 illustrates a correct aim at a head-on target.

(*d*) Fire.

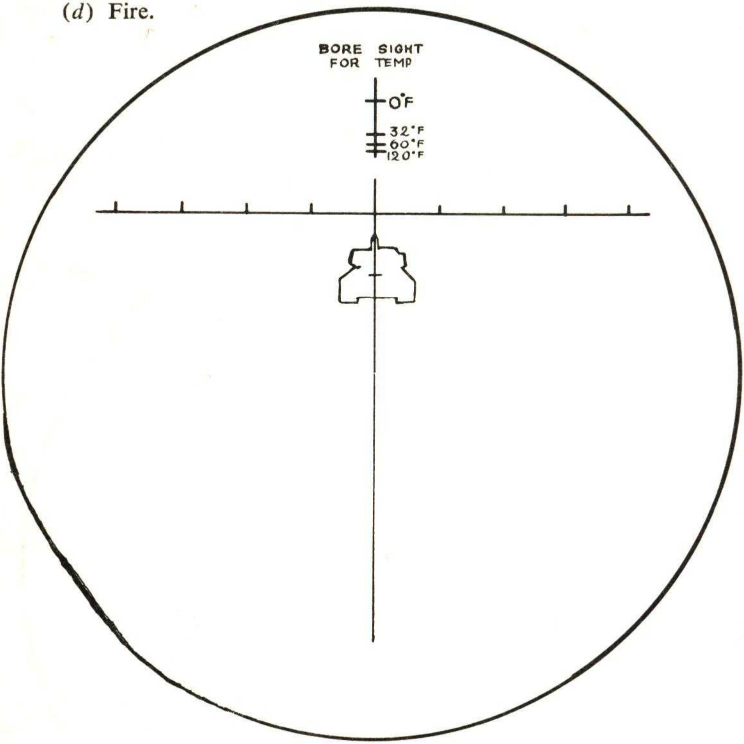


FIGURE 17—Aiming—one image

Target Moving Directly Away or Towards the Firer

10. Explain and demonstrate the sequence and method of laying a correct aim on targets moving directly away from or towards the firer.

(*a*) If the target is moving towards the firer, he will place the aiming mark slightly below the centre of the target.

(*b*) If the target is moving away from the firer, he will place the aiming mark slightly above the centre of the target.

NOTE

Under some conditions of terrain and light, when firing against targets on the move, it may be best for the range at which it is desired to engage the target, to be set (in metres) on the range scale, and the point of intersection of the vertical and horizontal lines in the object glass kept on the desired point of strike on one of the images. As the target approaches, the two images will appear to come closer together. When the two images merge into one, the target is at the range for which the sight has been set; the weapon is then fired.

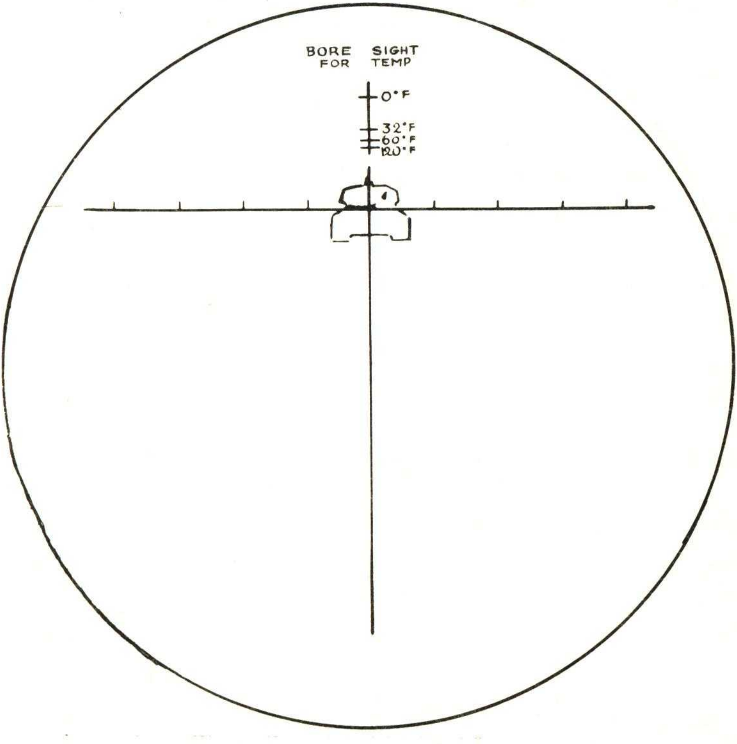


FIGURE 18—Correct aim on head—on target

Targets Moving Directly Across the Front (Fig 19)

11. Explain and demonstrate the sequence and method of laying a correct aim on a direct crossing target:

(*a*) Carry out the same procedure as in sub-paragraph (*a*), (*b*) and (*c*) for aiming at a stationary target.

(*b*) Estimate the speed to the nearest five miles per hour.

(*c*) Move the weapon until the appropriate vertical line on the large horizontal line in the object glass is layed on the desired point of strike on the target. The long vertical line must be always in front of the moving target. Fig. 20 illustrates the aim to be taken on a direct crossing target travelling at 10 mph from right to left.

(*d*) Fire.

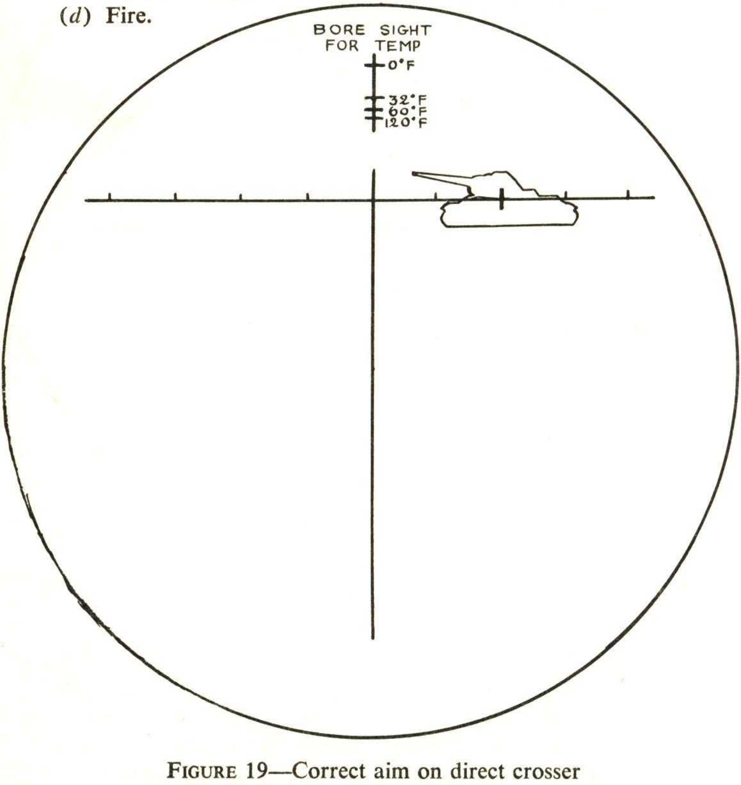


FIGURE 19—Correct aim on direct crosser

Targets Moving Diagonally Across the Front

12. Explain that a target moving at an angle across the front at a certain speed, will not cover laterally the same distance as a target moving at the same speed directly across the front. Therefore, the lead allowed for a target moving across at an angle will be less than the lead allowed for a direct crosser.

13. Explain that the procedure for aiming at a diagonal crosser (20 to 45 degrees from head-on) is the same as that applied to a direct crosser except that for equal speed of target only half of the lead is required.

14. Practise the squad at laying an aim on a head-on target, a direct crosser and a diagonal crosser.

Conclusion

15. Questions from and to the squad.

16. Sum up.

LESSON 7—MECHANISM

Aim

1. To teach the firing mechanism of the Launcher Rocket, A tk 3·2 inch CDN.

Instructors Notes

2. Stores: Launchers, drill rockets, charts, 2·5 volt bulb and wire lead.

3. Position of the squad: During this lesson, the squad should be seated at tables arranged in such a way that the class can observe all the actions of the instructor.

4. Training Aids: Make use of the 2·5 volt bulb and wire lead to show the flow of electricity when the trigger is pressed.

5. Trigger Mechanism: The trigger mechanism will not be stripped during the lesson.

CONDUCT OF THE LESSON

Preliminaries

6. Normal safety precautions.

Revision

7. Characteristics of the launcher and rocket.

Introduction

8. Explain that to understand the causes of a misfire in the launcher, the launcher team should know the action of the firing mechanism.

Action on Trigger Operation

9. Explain that the launcher is fired by means of an electric current generated by a small magneto located in the firing grip. The magneto functions when the trigger is pressed.

10. The current is picked up by the contact lead wire and carried to the contact band which is insulated from the barrel by the insulating sleeve. From the contact band, the current is carried to the contact spring. The shorting tab and firing lead then carries the current to an electric igniter (low tension fuze) in the igniter powder composition of the rocket.

11. To complete the circuit, the ground lead carries the current from the electric igniter (low tension fuze) back to the eyelet on the shroud. The tube then picks up the current and passes it back to the magneto in the firing grip.

12. Question the squad.

Igniter and Leads

13. Explain that the igniter used to ignite the powder composition (which fires the propellant), is a small cardboard case containing a small powder charge and an electric squib. The igniter has two leads, the ground lead connected to the eyelet in the shroud, and the firing lead which is connected to the contact spring by means of the shorting tab.

Mechanism of the Safety Button

14. Explain that when the safety button is set at "SAFE", the trigger is blocked by a small square stud located on the safety button inside the firing grip. Since the trigger cannot be operated, no current can be generated.

15. When the safety button is set at "FIRE", the square stud is disengaged from the trigger allowing it to be pressed and thereby activating the small magneto and creating an electrical impulse.

16. Explain that when the launcher is not being fired, the safety button should always be set at "SAFE".

Conclusion

17. Questions from and to the squad.

18. Sum up.

LESSON 8—THE 9-INCH RANGEFINDER SIGHT

Aim

1. To teach the rangefinder sight and how to make coincidence.

Instructors Notes

2. Stores: Sights, launchers, sight stands, sights and charts.

3. Position of the squad: During this lesson, the squad should be placed in a position where the soldiers can easily observe the demonstrations given by the instructor.

4. Give the description of the rangefinder sight and show how to make coincidence. Take the squad outdoors and have them make coincidence on objects ranging from 100 to 500 metres. This will determine the personnel who show aptitude for the work. The following facts are the basis of the lesson but may sound complicated to the soldier. It is therefore emphasized that maximum use must be made of explanation and demonstrations.

5. In order to ensure that the instrument is functioning properly outdoors it should if possible be exposed to the outside temperature for a period of approximately two hours before any adjustments are made. This may not always be possible during training, but an attempt should be made to do so in sub-zero weather.

CONDUCT OF THE LESSON

Preliminaries

6. Normal safety precautions.

Introduction

7. Explain that the 9-inch Rangefinder Sight, (Figs 20 and 21), is primarily a sight, secondly a rangefinder, and lastly may be used as a telescope since the lens have a magnification of 5X. The sight weighs approximately five pounds. It has a 9-inch base. When used with the launcher, it will permit a 90 per cent chance of first round hit at 300 yards.

General Description

8. Explain that the sight combines a coincidence type of fixed focus rangefinder with a mechanical system which automatically applies the correct elevation to the sighting system by moving the reticle vertically in the field of view. The greater the range, the lower will be the horizontal aiming line and consequently the more the weapon and

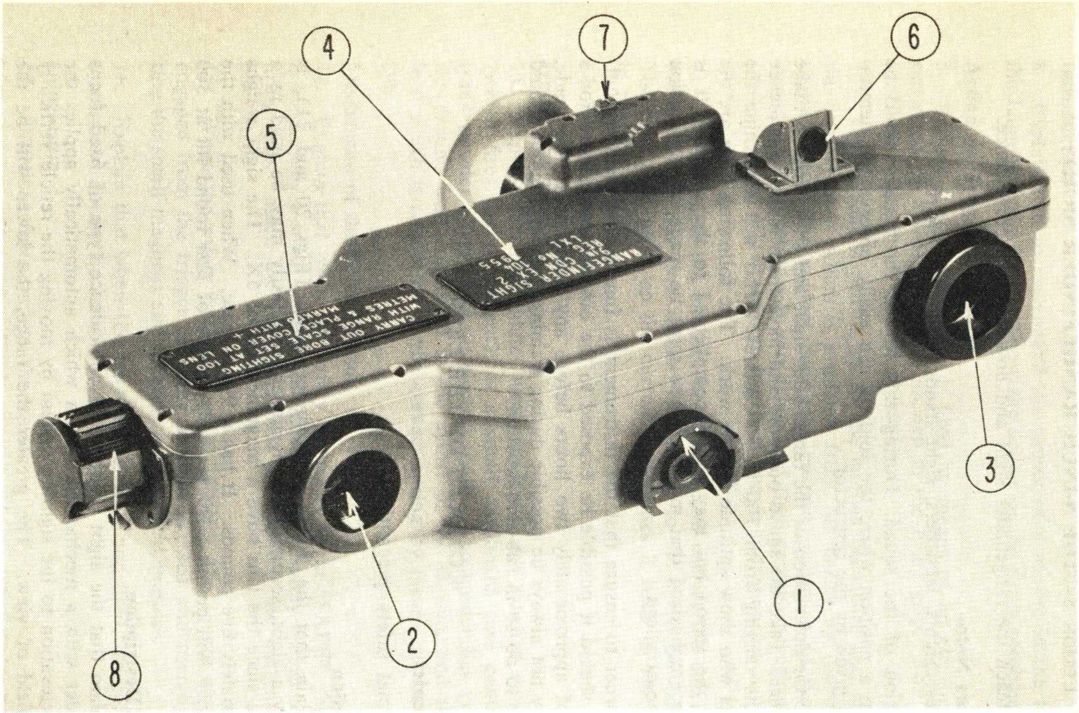

4
7
6
5
CARRY OUT BORE SIGHTING WITH RANGE SCALE SET AT 100 METRES & PLACE COVER ON LENS MARKED WITH +
3
1
2
8

FIGURE 20—The 9-inch rangefinder sight (front and top view)

1 mounting optical lath
2 right hand window
3 left hand window
4 name plate
5 instruction plate
6 illumination prism
7 open sight
8 control mechanism knob

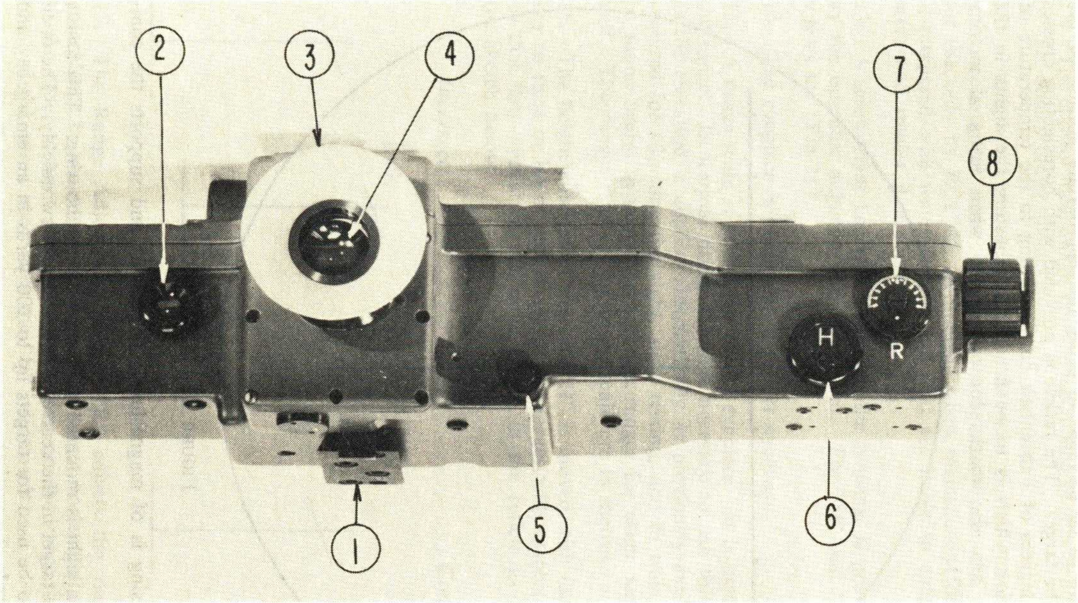


FIGURE 21—The 9-inch rangefinder sight (rear and bottom view)

1 dovetail
2 range scale window
3 eyeguard
4 eyepiece
5 screwdriver key
6 height adjustment
7 range adjustment
8 control mechanism knob

sight will have to be elevated to bring the appropriate portion of the reticle onto the target. The reticle is provided with boresighting crosses (marked in degrees of Fahrenheit corresponding to the temperature of the ammunition which is to be fired) for adjusting the sights in the field. There are also marks for aiming off when firing at moving targets (Fig 22).

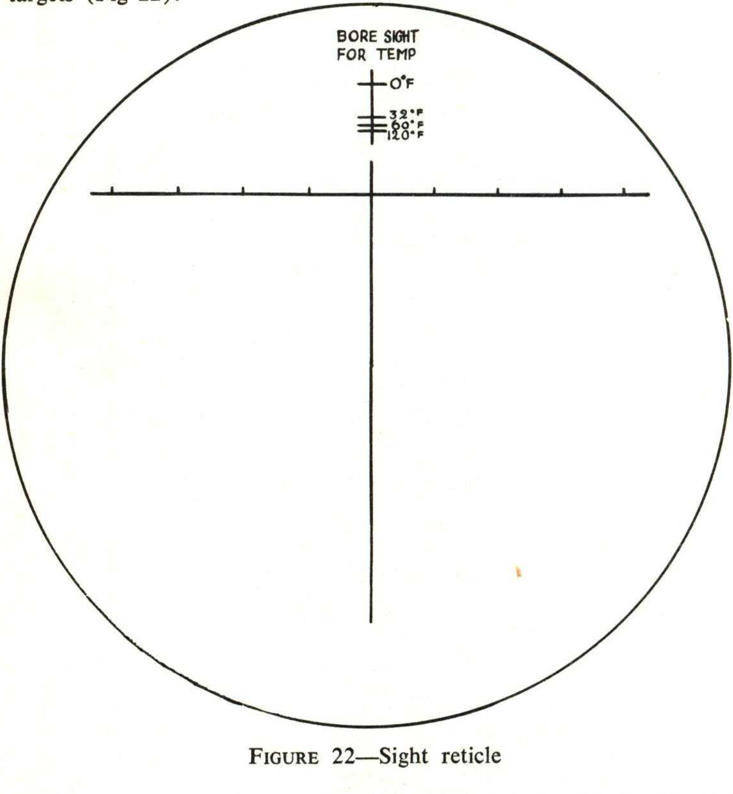


FIGURE 22—Sight reticle

9. The housing is of magnesium. It protects and supports the components.

10. An open sight is mounted on the top of the housing. This assists in getting the target in the centre of the field of view quickly. The open sight can also be used for targets up to 200 yards in an emergency and under 100 yards at any time.

11. The control mechanism knob is the means of producing coincidence of the object under observation.

12. There is a red coloured screw at each end of the sight. Under no circumstances must these screws be tampered with as they are for use only by RCEME technicians when maintaining the instrument. If tampered with water vapour and dust are liable to enter the instrument and render it unserviceable.

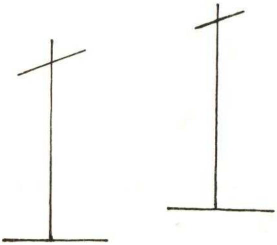
13. A screwdriver key which fits into the housing, is provided for use by the operator adjusting the instrument. For "H" and "R" adjusting screws see (Fig 21).

14. The eyepiece is fitted with a rubber eyeguard.

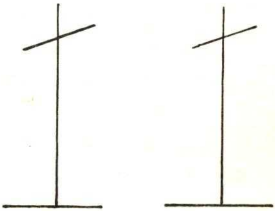
15. A range scale is at the left of the eyepiece. It is used for reading the range. In normal firing it is not necesary to use this range scale as the elevation is applied automatically as previously explained. It is required for adjusting the sight, sight testing, and in training. It may be found useful in providing accurate ranges for other weapons in the unit. The ranges read on the range scale are in metres.

16. The height adjustment marked "H" is moved with the screwdriver key to raise or lower one image of the target with respect to the other so that they appear at the same height in the reticle as illustrated in the sketch below.

Incorrect



Correct



17. The Range Adjustment marked "R" adjusts the rangefinder for coincidence by moving one image of the target horizontally with respect to the other without changing the reading on the range scale. Movement of this screw may alter the "H" adjustment.

18. Question the squad.

19. Practise the students in making coincidence outdoors on objects ranging from 100 to 500 metres.

Conclusion

20. Questions from and to the squad.

21. Sum up.

LESSON 9—**HANDLING**

Aim

1. To practise launcher teams in the handling of the launcher in the field in order to obtain correct battle technique.

Instructors Notes

2. Stores: Launcher, drill rockets, carrying harness, moving tank targets (vehicles).

3. Position of the squad: During the early part of the lesson, the squad should be seated in a position where they can observe and hear the instructor.

4. Target priorities, siting and choosing fire positions should be discussed before commencing practical work.

5. The ground to be used must be carefully chosen. It should be a likely defensive position offering:

- (*a*) Likely lines of tank approach.
- (*b*) Launcher positions which afford,
  - (i) good concealment from ground and air
  - (ii) defilades from the front
  - (iii) good exits for moves to alternative positions
  - (iv) good fields of fire

6. Vehicles will be required to move across front and along likely tank approaches at various speeds.

CONDUCT OF THE LESSON

Preliminaries

7. Normal safety precautions.

Revision

8. Firing positions Lesson 4.

Introduction

9. Technical knowledge and handling of the launcher are only the preliminary work. To be effective in battle, the launcher team must be practised in battle handling so that they work together efficiently and acquire a battle technique which will ensure "one rocket, one tank".

Target Priorities

10. Explain that the primary role of the weapon is to kill tanks. This must always be considered before allotting the launcher to any other role.

11. In its secondary role the launcher can be used against heavy weapons, fortifications and buildings. It may be used as an anti-personnel weapon with good effect against groups of men.

Siting and Selecting of Fire Positions

12. Explain that in addition to normal field craft training, the following points must be considered when siting fire positions in defence:

(*a*) The position must provide cover, concealment and freedom of traverse.

(*b*) Owing to the flash of the launcher, it will be necessary for the team to move to alternative positions after engaging a target.

(*c*) The approach to the position should offer concealment.

(*d*) As tanks are most vulnerable on the sides, the best position will be one which is defiladed from the front, the launcher firing across the line of advance of the tanks.

(*e*) Consideration must be given to the back-blast from the launcher. No 2 must always be on the alert to prevent injury to himself, No 1 and other friendly troops. In dry and dusty climates the area of the back-blast and front of launcher must be carefully watered or matted to prevent excessive dust or grass fires. There must always be a clear space behind the rear of the launcher, especially when it is fired from a fire trench. Particular care must be taken to ensure that no rockets or ammunition of any kind are in the danger area of the back-blast.

(*f*) The field of fire will depend upon the ground but in general, the shorter the range, the more certain the kill. In its primary role therefore, the minimum field of fire is 100 yards and the maximum field of fire need not be greater than 600 yards. All tanks, moving or stationary, within 300 yards will be "killed".

(*g*) To obtain surprise the launcher team must remain concealed and quiet as long as possible.

(*h*) The launcher can be used for street fighting. It can be fired from buildings, but great care must be taken that the back-blast does not endanger own troops.

(*j*) Launchers should be mutually supporting and in defence, will be sited in depth throughout the position. Where possible their arcs of fire should overlap, covering all likely tank approaches.

The Launcher Team

13. Explain and demonstrate, using members of the squad, the duties of personnel and equipment carried by each individual.

No	Duty	Equipment Carried	Remarks
1	Firer	Launcher and Sights	Permanent Launcher Team
2	Loader	Rifle and Bayonet, 3 rockets	Permanent Launcher Team

NOTE:

Ammunition carriers may be detailed from rifle platoon when required.

Crawling

14. Explain that crawling may be necessary when occupying an exposed position. The methods of crawling as taught with LMG, can be adopted for crawling with the launcher.

15. The rangefinder should never be mounted until the weapon is in a firing position. This prevents damage occurring to the sight.

16. Practise the squad in crawls, individually, and in pairs.

Launcher Emplacement

17. The launcher can be fired from the normal fire trench. Fig 23 illustrates a suggested launcher emplacement.

Conduct of Training

18. Take the squad over a suitable piece of ground that has three launcher positions covering the arcs in which are likely tank approaches. At least one of the positions should be defiladed from the front, dug and fully developed.

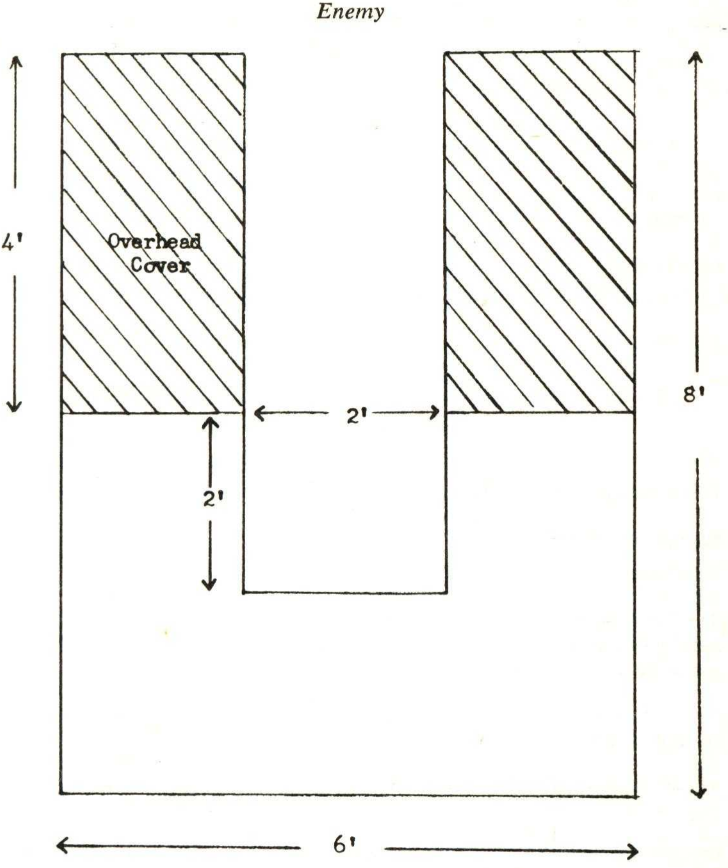


FIGURE 23—Launcher emplacement

19. Exercise the squad on fresh ground, by pointing out the arc of fire, and the area in which positions are to be sited.

20. Allow time for reconnaissance, then practise the squad in teams.

21. When vehicles are available make full use of them as moving targets.

22. Discuss each team's performance under the following headings:

(*a*) The approach and occupation of the position
(*b*) The alternative positions
(*c*) The team work
(*d*) Points of elementary fieldcraft and launcher training.

23. Further practice should be given on fresh ground whenever time permits.

Conclusion

24. Questions from and to the squad.

25. Sum up.

LESSON 10—ADJUSTING THE RANGEFINDER SIGHT ON KNOWN DISTANCES

Aim

1. To teach how to adjust the rangefinder sight on known ranges.

Instructors Notes

2. Stores: Sight, sight stands or launchers.

3. Position of the squad: During this lesson, the squad should be placed in a position where the soldiers can easily observe the demonstrations given by the instructor.

4. The lesson will be taught outdoors. Well defined objects should be set out at known distances between 100, 200, 300, 400 and 500 metres. These ranges must be known within a tolerance of $\frac{\text{Range,}}{100}$ squared, divided by 10, $\left[\frac{R}{100}\right]^2 \div 10$. This gives the following approximate tolerances:

4 ins	—	100 yards
14 ins	—	200 yards
3 ft	—	300 yards
5 ft	—	400 yards
7½ ft	—	500 yards

5. Each member of the squad will be required to take a series of ten observations (making coincidence) on a known range.

CONDUCT OF THE LESSON

Preliminaries

6. Normal safety precautions when launchers are used instead of sight stands.

Revision

7. The Rangefinder Sight Lesson 8.

Sight Testing

8. Explain and demonstrate the sequence and method of testing the rangefinder sight on a known range by means of the control mechanism knob:

(*a*) Turn the control mechanism knob and take ten readings (make coincidence), so that the last motion in making coincidence is alternately up and down.

(*b*) Adjust the "H" screw when necessary.

(*c*) Note the readings on the range scale.

(*d*) Find the mean observed range by adding all the observed ranges and dividing the sum by ten.

(*e*) Find the mean range deviation by subtracting the mean observed range from all the observed ranges, total the results, regardless whether plus or minus, and divide by ten. If the result does not exceed the $\frac{\text{(range)}}{100}$ squared and divided by two, the test is reliable, $\left[\frac{\text{R}}{100}\right]^2 \div 2$.

(*f*) Find the mean range error by subtracting the known range from the mean observed range ie $(199{\cdot}5 - 200 = -{\cdot}5)$. If the mean range error exceeds plus or minus the $\frac{\text{(range)}}{\text{(100)}}$ squared and divided by three, the rangefinder sight requires adjustment, $\left[\frac{\text{R}}{100}\right]^2 \div 3$.

Sighting Adjusting

9. Explain and demonstrate the sequence and method of adjusting the sight on a known range using the range adjustment:

(*a*) Set the known range on the range scale.

(*b*) Adjust the "H" screw when necessary.

(*c*) Turn the range adjustment "R" and take ten readings (making coincidence), so that the last motion in making coincidence is alternately right and left.

(*d*) Note the readings on the range adjustment to the nearest 0·1 of a division for each reading.

(*e*) Find the mean of the reading by subtracting the sum of the minus readings from the sum of the plus readings and dividing the result by ten.

(*f*) Set the range adjustment to the mean of the readings.

(*g*) Examine the range scale window to ensure that the setting has not moved.

(*h*) Carry out the test as taught in para 8. If the mean range error exceeds plus or minus $\frac{(\text{range})}{(100)}$ squared and divided by 3, the rangefinder sight must be re-adjusted until the test is passed.

10. Practise the squad in testing and adjusting the rangefinder sight on known distances.

Conclusion

11. Questions from and to the squad.

12. Sum up.

Lesson 11—BORESIGHTING

Aim

1. To teach boresighting by the use of:

(*a*) The optical boresight

(*b*) The muzzle and breech attachments.

Instructors Notes

2. Stores: Launcher, sights, optical boresight and boresighting tool, the muzzle and breech boresight attachments.

3. Muzzle and breech boresight attachments may be made locally from: two circular pieces of plywood three-and-one fifth inches in diameter, four tacks or small screws, two two-and-one-half inch lengths of thin wire.

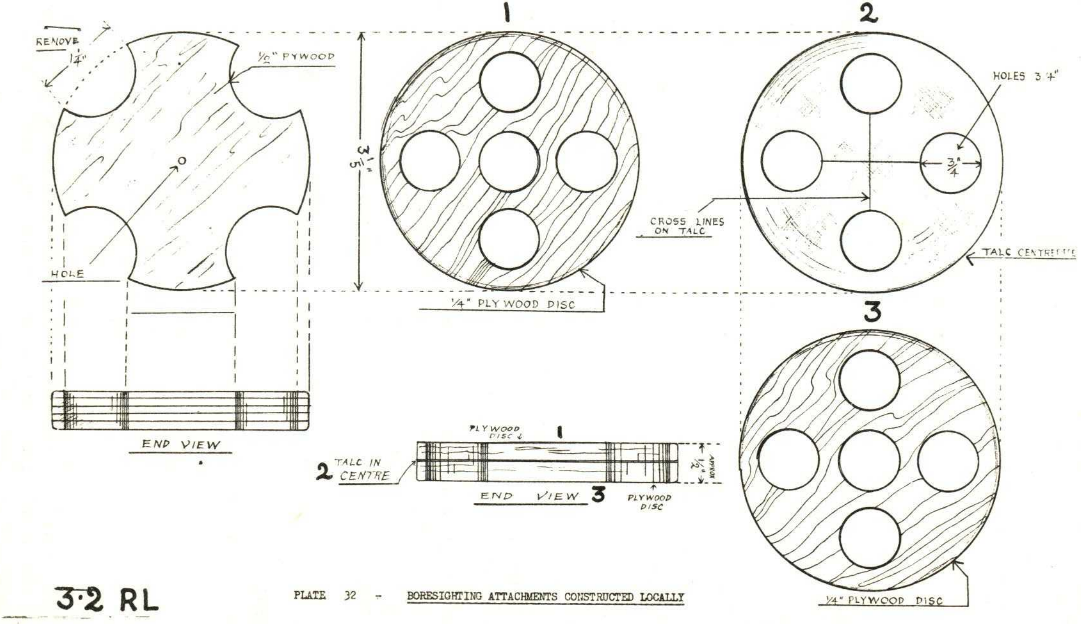

1
2
3
REMOVE
1/4"
1/2" PYWOOD
O
HOLE
END VIEW
3 1/5"
1/4" PLY WOOD DISC
HOLES 3/4"
3/4
CROSS LINES ON TALC
TALC CENTRE
3
1/4" PLYWOOD DISC
PLYWOOD DISC
1
2 TALC IN CENTRE
END VIEW 3
PLYWOOD DISC
APPROX 1/2"
3·2 RL
PLATE 32 - BORESIGHTING ATTACHMENTS CONSTRUCTED LOCALLY

FIGURE 24—Boresighting attachments constructed locally

(*a*) Shape one piece of wood by boring five three-quarter inch holes as shown in Fig. 24. One of these holes should be dead centre, the others act as finger holes, and should be evenly spaced near the edge of the wood. Fit the pieces of wire in the central hole to form cross hairs which are held in position by tacks or screws. The intersection of the wires should be in the centre of the central hole. This is the front attachment.

(*b*) Shape the other piece of wood by making the peep hole in the centre approximately one-sixteenth inch in diameter, and cutting four finger arcs, equally spaced, on the edge of the wood. This is the rear attachment.

4. Position of the squad: During this lesson the squad should be placed in a position where the soldiers can easily observe the demonstrations given by the instructor.

5. The squad will work in pairs, each member taking turn in adjusting the rangefinder sight and aligning the tube onto the distant object.

6. The boresight setting is determined by the temperature of the ammunition and not by the temperature of the surrounding air.

7. It is important that practice on boresighting be carried out at night in a restricted space (fire trench) in order to accustom the soldier to boresighting under difficult conditions.

8. Mask the left hand window during the entire procedure. The left window is the object glass for the moveable image and an incorrect line of sight will be obtained if boresighting is carried out with the window open.

CONDUCT OF THE LESSON

Preliminaries

9. Normal safety precautions.

Revision

10. Aiming (Lesson 6).

Introduction

11. The lesson contains two methods of boresighting, one with an optical instrument, the other with improvised attachments. The two methods may be employed with equal accuracy.

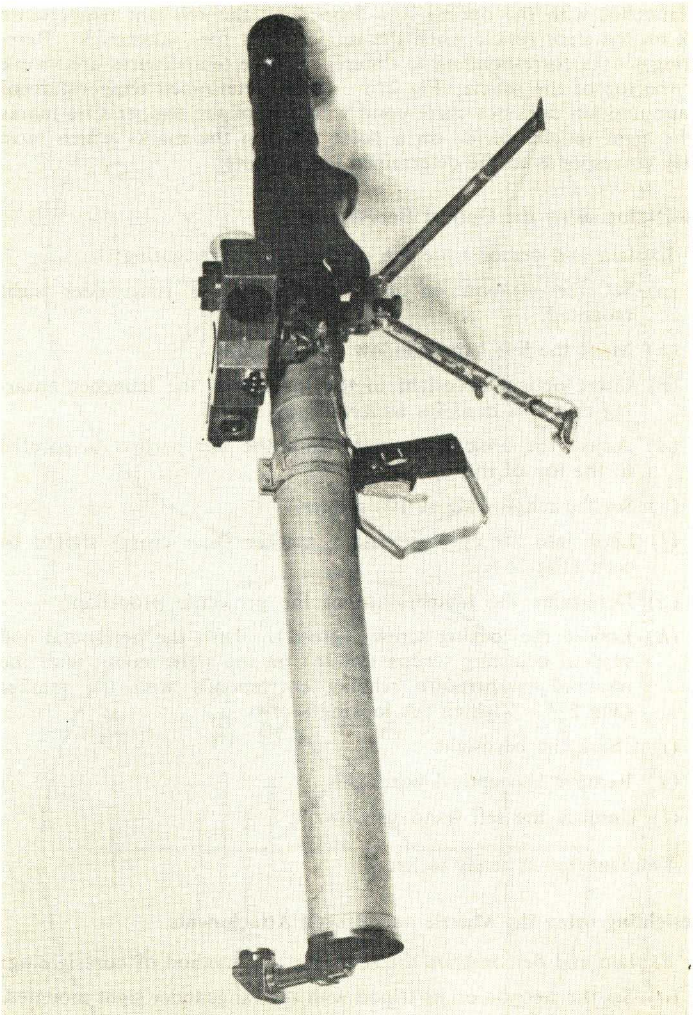


FIGURE 25—Optical boresight mounted on launcher

12. The purpose of boresighting is to line up the mechanical axis of the launcher with the optical line defined by the relevant temperature mark on the sight reticle when the reticle is set for 100 metres. Boresighting marks corresponding to different charge temperaures are visible near the top of the reticle (Fig 22). If the determined temperature of the ammunition does not correspond with any of the temperature marks on the sight reticle, decide on a point between the marks which most closely corresponds to the determined temperature.

Boresighting using the Optical Boresight

13. Explain and demonstrate the sequence of boresighting:

(*a*) Set the weapon on its tripod with the rangefinder sight mounted.

(*b*) Mask the left hand window on the sight.

(*c*) Insert optical boresight in the muzzle of the launcher ensuring that it is in as far as it will go (Fig 25).

(*d*) Adjust the optical boresight until the flat portion is parallel to the top of the sight.

(*e*) Set the range scale at 100 metres.

(*f*) Look into the eyepiece and a marker (hair cross) should be seen (Fig 26).

(*g*) Determine the temperature of the projectile propellant.

(*h*) Loosen the locking screws (green). Turn the horizontal and vertical adjusting screws (white) on the sight mount until the required temperature reading corresponds with the marker (Fig 27). Tighten the locking screws.

(*j*) Check the boresight.

(*k*) Remove the optical boresight.

(*l*) Unmask the left hand window.

14. The launcher is ready to fire.

Boresighting using the Muzzle and Breech Attachments

15. Explain and demonstrate the sequence and method of boresighting:

(*a*) Set the weapon on its tripod with the rangefinder sight mounted.

(*b*) Set the range scale at 100 metres.

(*c*) Mask the left hand window on the sight.

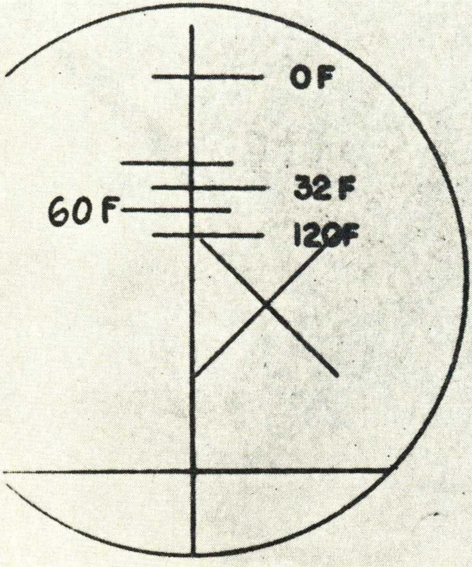
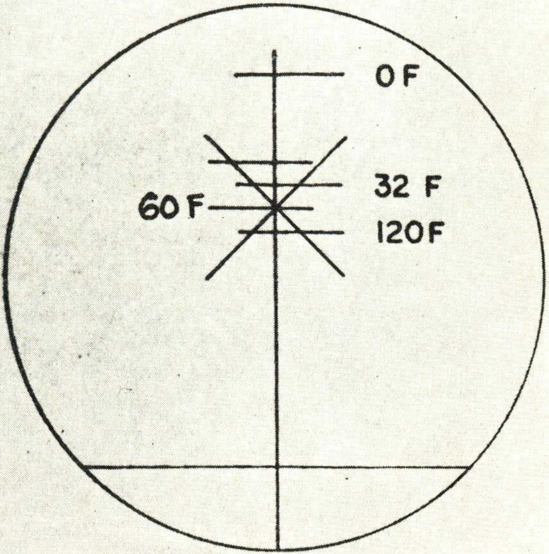

0F
32F
60F
120F

FIGURE 26—Markers seen in optical boresight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120F

FIGURE 27—Position of marker in optical boresight when correctly sighted

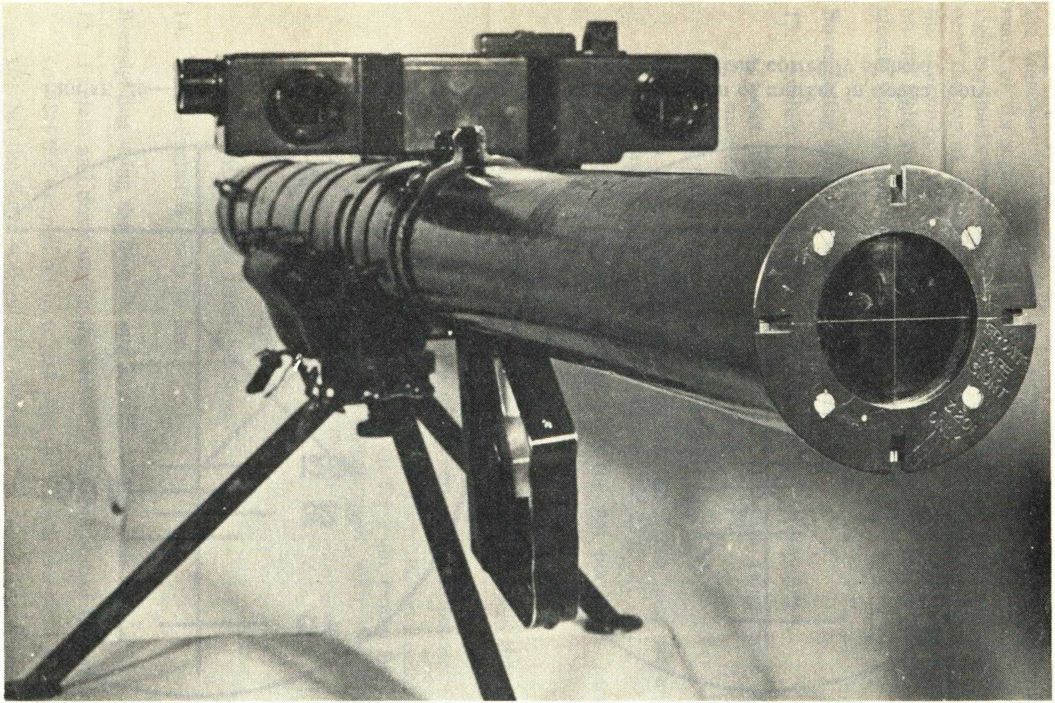


FIGURE 28—Front boresight attachment mounted in launcher

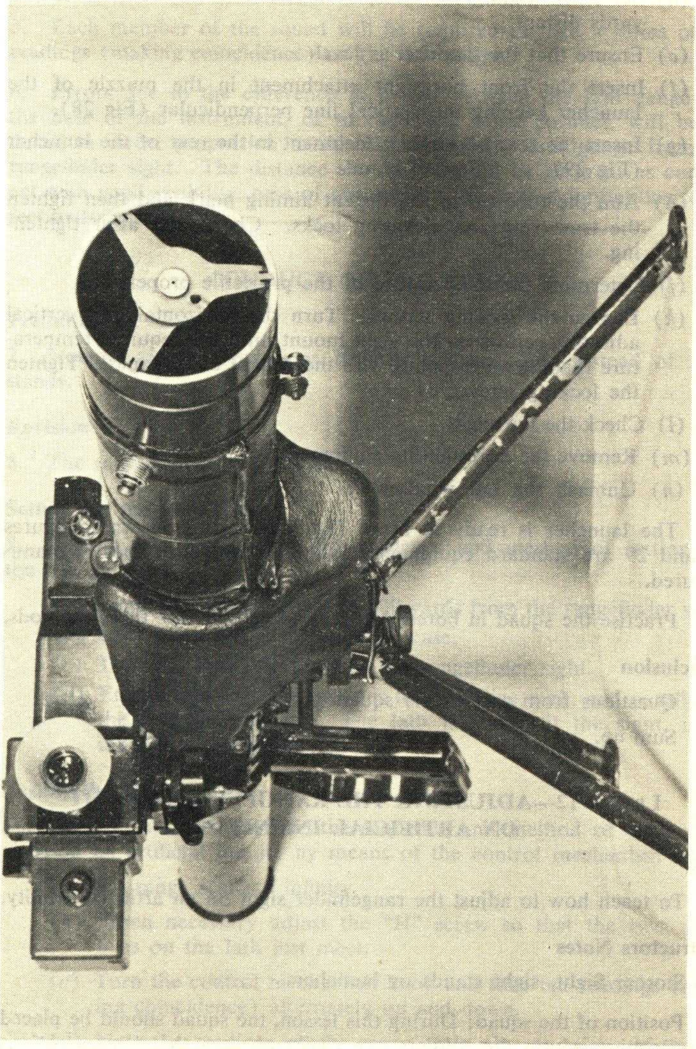


FIGURE 29—Rear boresight attachment mounted in launcher

(*d*) Select an aiming mark, ie, a well defined object at least 700 yards distant.

(*e*) Ensure that the launcher is level.

(*f*) Insert the front boresight attachment in the muzzle of the launcher keeping the vertical line perpendicular (Fig 28).

(*g*) Insert the rear boresight attachment in the rear of the launcher (Fig 29).

(*h*) Aim the tube on to the distant aiming mark and then tighten the traversing and elevating locks. Check aim after tightening.

(*j*) Determine the temperature of the projectile propellant.

(*k*) Loosen the locking screws. Turn the horizontal and vertical adjusting screws on the sight mount until the required temperature reading corresponds with the distant aiming mark. Tighten the locking screws.

(*l*) Check the boresight.

(*m*) Remove the boresighting equipment.

(*n*) Unmask the left window.

16. The launcher is ready to fire. The attachments shown in figures 28 and 29 are standard equipments and have not been locally manufactured.

17. Practise the squad in boresighting using each of the three methods.

Conclusion

18. Questions from and to the squad.

19. Sum up.

LESSON 12—ADJUSTING THE RANGEFINDER SIGHT ON ARTIFICIAL INFINITY

Aim

1. To teach how to adjust the rangefinder sight on an artificial infinity.

Instructors Notes

2. Stores: Sight, sight stands or launchers.

3. Position of the squad: During this lesson, the squad should be placed in a position where the soldiers can easily observe the demonstrations given by the instructor.

4. This lesson can be taught indoors if necessary.

5. Each member of the squad will be required to take a series of ten readings (making coincidence) on the lath gauge.

6. Errors due to the difference in length between the lath gauge and the base of the instrument, or to their not being parallel, will be reduced in direct proportion to the distance of the lath gauge from the rangefinder sight. The distance should therefore be as great as consistent with good visibility, ease of observation, or ground limitations ie, 50 feet to 100 yards.

CONDUCT OF THE LESSON

Preliminaries

7. Normal safety precautions if launchers are used instead of sight stands.

Revision

8. The rangefinder sight Lesson 8.

Setting out the Lath Gauge

9. Explain and demonstrate the sequence and method of setting out the lath gauge:

(*a*) Select a position 50 feet to 100 yards from the rangefinder sight.

(*b*) Lock open the lid of the sight case.

(*c*) Turn the lath side towards the rangefinder sight.

(*d*) Ensure that the lath gauge is level, in line with, and parallel to the rangefinder sight. The lath is aimed at the sight, using the iron sights on the case lid.

Testing the Sight

10. Explain and demonstrate the sequence and method of testing the sight on an artificial infinity by means of the control mechanism knob:

(*a*) Set range scale to infinity.

(*b*) When necessary adjust the "H" screw so that the two white lines on the lath just meet.

(*c*) Turn the control mechanism knob and take ten readings (making coincidence) alternately up and down.

(*d*) Note the readings on the range scale plus or minus of the infinity mark, to the nearest 0·1 of a division.

(*e*) Find the mean of the readings by subtracting the sum of the minus readings from the sum of the plus readings and dividing the result by ten as follows:

Observations

Plus (+)	*Minus (—)*
1·2	1·3
0·8	2·0
0·7	0·2
2·0	0·5
0·6	
1·0	
Plus (+) 6·3	Minus (—) 4·0
	Plus (+) 6·3
	(+) 2·3

The mean of the reading is plus (+) $\frac{2{\cdot}3}{10}$ = (+) ·23 divisions

(*f*) Find the mean deviation by subtracting the mean reading from all the observed readings. Total all the answers disregarding plus and minus, and divide by ten as follows:

Observations		*Mean Observed Reading*	*Deviations*
Plus	*Minus*		
1·2		+ ·23	·97
	1·3	+ ·23	1·53
0·8		+ ·23	·57
	2·0	+ ·23	2·23
0·7		+ ·23	·47
	0·2	+ ·23	·43
2·0		+ ·23	1·77
0·6		+ ·23	·37
	0·5	+ ·23	·73
1·0		+ ·23	·77
		Total of deviations equals	9·84

the mean deviation is $\frac{9{\cdot}84}{10}$ = ·984 (*g*) If the mean deviation does not exceed 2·4 divisions, the test is reliable.

(*h*) If the mean of the readings exceeds plus or minus 1·5 divisions, the instrument requires adjustment.

Adjusting the Sight

11. Explain and demonstrate the sequence and method of adjusting the sight on an artificial infinity using the range adjustment:

(*a*) Set out the lath gauge as taught in para 9.

(*b*) Set the zero line on the range scale to the infinity mark.

(*c*) Adjust the "H" screw when necessary.

(*d*) Turn the range adjustment "R" and take ten readings (making coincidence), right and left alternately.

(*e*) Note the readings on the range adjustment to the nearest 0·1 of a division for each reading. Each sub-division on the range adjustment scale is equal to three divisions in the vicinity of the ∞ mark on the range scale.

(*f*) Find the mean of the readings by subtracting the sum of the minus readings from the sum of the plus readings and dividing the result by ten.

(*g*) Set the range adjustment to the mean of the readings.

(*h*) Examine the range scale window to ensure that the setting has not moved.

(*j*) Carry out the test as taught in para 10. If the mean error then exceeds plus or minus 1·5 divisions, the instrument must be re-adjusted until the test is passed.

12. Practise the squad in testing and adjusting the rangefinder sight on an artificial infinity.

Conclusion

13. Questions from and to the squad.

14. Sum up.

LESSON 13—USES OF THE OPTICAL LATH

Aim

1. To teach the use of the optical lath in adjusting the rangefinder sight and in boresighting.

Instructors Notes

2. Launcher, sights, optical lath, bore adapter and bore sighting tool.

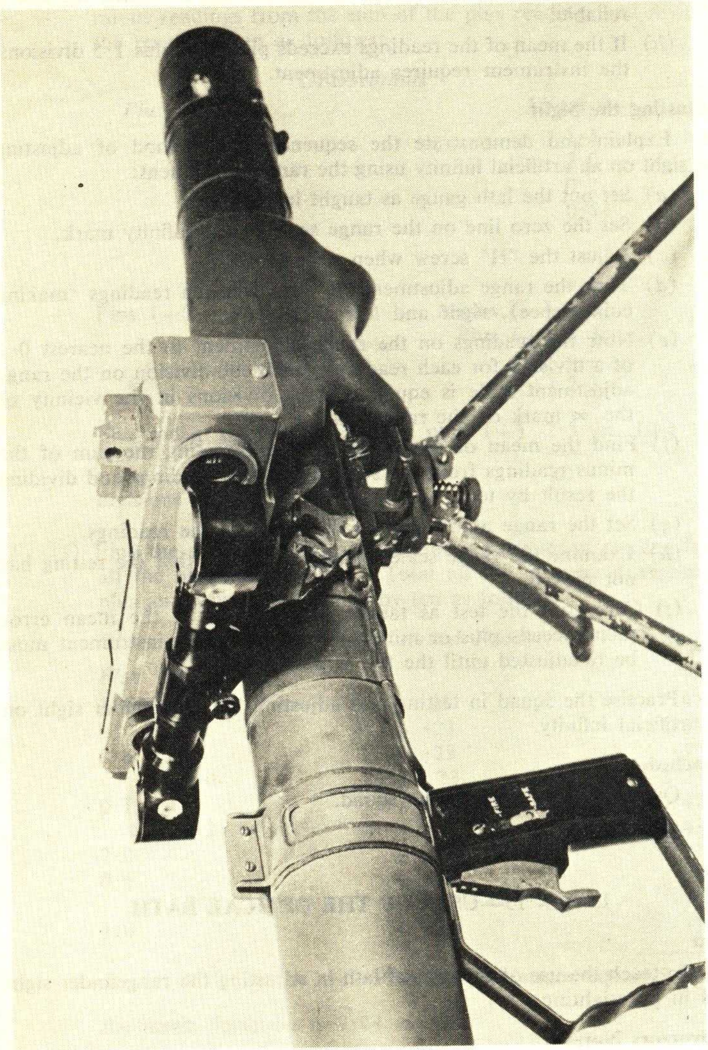


FIGURE 30—Optical lath mounted on the rangefinder sight

3. Position of the squad: During this lesson, the squad should be placed so that all demonstrations by the instructor may be observed.

4. It is important that practice in adjusting the sight and in boresighting is conducted under field conditions in order that the soldier becomes accustomed to working under difficult conditions.

CONDUCT OF THE LESSON

Preliminaries

5. Normal safety precautions.

Revision

6. Adjusting the rangefinder sight on known distances and on an artificial infinity, and boresighting.

Introduction

7. The optical lath is a dual purpose instrument which permits the adjustment and testing of the rangefinder sight, and boresighting of the weapon in restricted space whether at day or night.

Sight Adjusting

8. When adjusting the rangefinder sight with the optical lath it is not necessary to set out the lath gauge, and errors are eliminated at a realistic fighting range (i.e. 300 metres) instead of at infinity.

9. Explain and demonstrate the sequence and method of adjusting the rangefinder sight using the optical lath:

- (*a*) Secure the optical lath to the mounting on the rangefinder sight as shown in Fig 30 (the sight need not be mounted on the launcher).
- (*b*) Set the range scale at 300 metres.
- (*c*) Look into the eyepiece and a pair of markers as in Fig 31 should be seen.
- (*d*) Using the range adjustment, set the vertical marker in coincidence.
- (*e*) Turn the height adjustment until the markers are in position as shown in Fig 32.
- (*f*) Using the range adjustment, take 10 readings on the range scale, each time obtaining coincidence of the vertical markers.

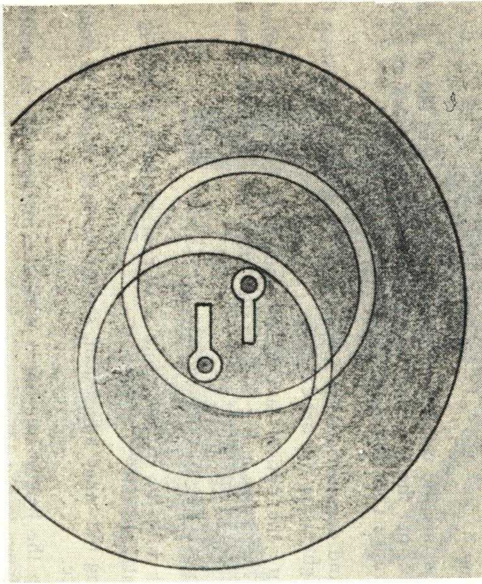


FIGURE 31—Markers seen in optical lath

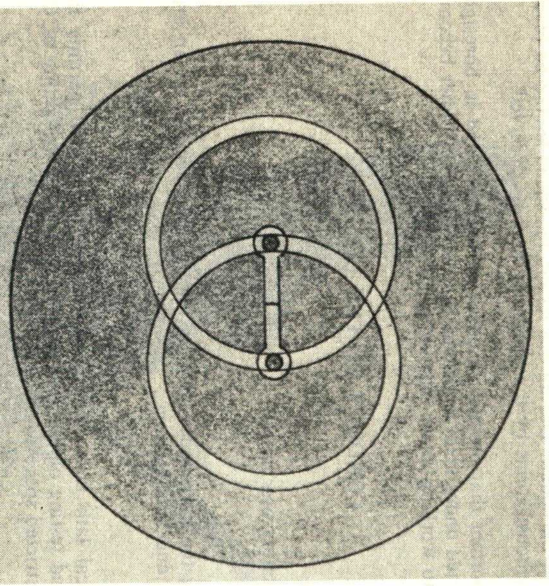


FIGURE 32—Position of markers in optical lath when adjusted

(*g*) Find the mean of the readings on the range scale by subtracting the sum of the minus readings from the sum of the plus readings and dividing the answer by ten.

(*h*) Set the range adjustment to the mean of the reading found in para (*g*).

(*j*) Check that the range scale is still accurately set at 300 metres.

10. Practise the squad in adjusting the rangefinder sight using the optical lath.

Sight testing

11. Explain and demonstrate the sequence and method of testing the rangefinder sight using optical lath:

(*a*) Secure the optical lath to the mounting on the rangefinder sight.

(*b*) Using the control mechanism knob, take 10 readings on the range scale, each time obtaining coincidence.

(*c*) Find the mean of the readings.

(*d*) If the mean of the readings differs from 300 metres by more than 5 metres the sight needs adjustment.

Boresighting Using the Optical Lath

12. Explain and demonstrate the sequence of boresighting:

(*a*) Set the weapon on its tripod with the rangefinder sight mounted.

(*b*) Mask the left hand window on the sight.

(*c*) Secure the optical lath to the bore adapter (Fig 33).

(*d*) Insert the bore adapter into the muzzle of the launcher ensuring that it is in as far as it will go (Fig 34).

(*e*) Adjust the bore adapter until the flat portion is parallel to the top of the sight.

(*f*) Set the range scale at 100 metres.

(*g*) Determine the temperature of the projectile propellant.

(*h*) Look into the eyepiece and a marker (keyhole) should be seen (Fig 35).

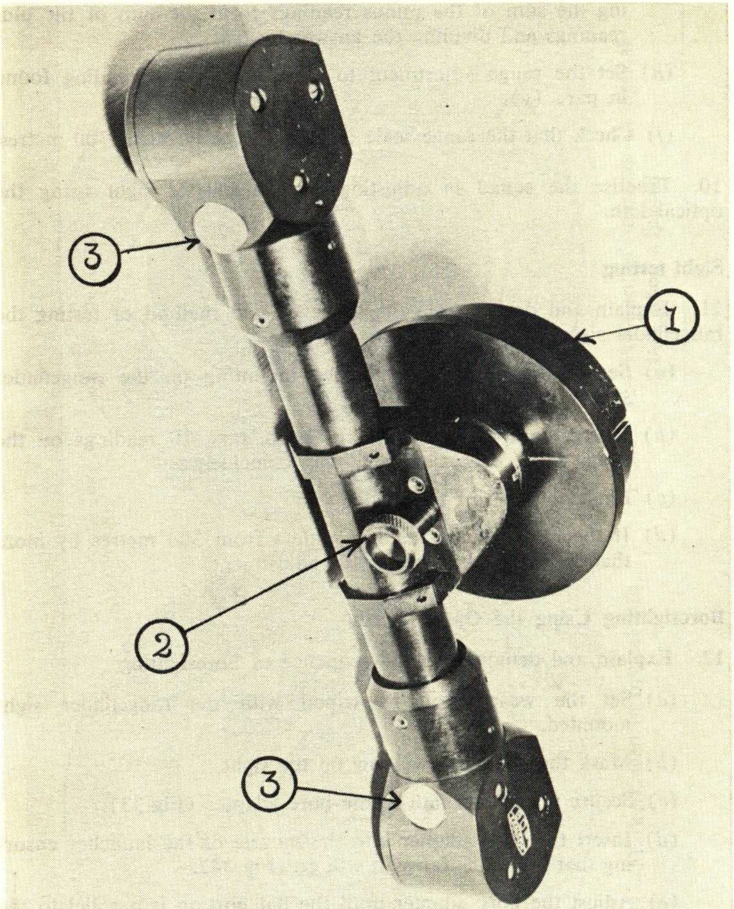


FIGURE 33—Optical lath attached to bore adapter

1	bore adapter
2	screw
3	illuminating discs

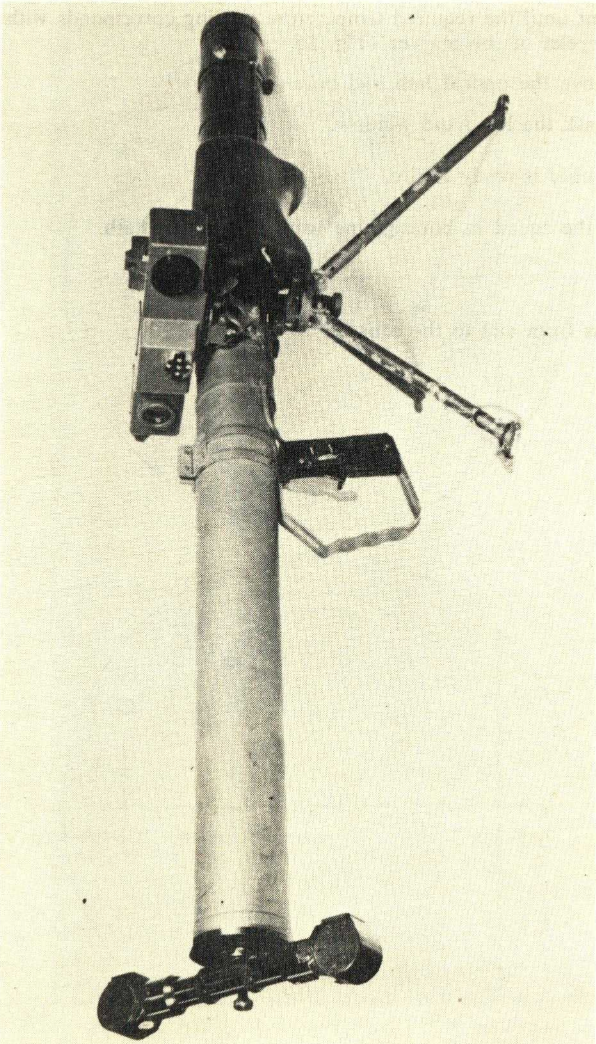


FIGURE 34—Optical lath and bore adapter mounted on launcher

(*j*) Turn the horizontal and vertical adjusting screws on the sight mount until the required temperature reading corresponds with the eyelet of the marker (Fig. 36).

(*k*) Remove the optical lath and bore adapter.

(*l*) Unmask the left hand window.

13. The launcher is ready to fire.

14. Practise the squad in boresighting using the optical lath.

Conclusion

15. Questions from and to the squad.

16. Sum up.

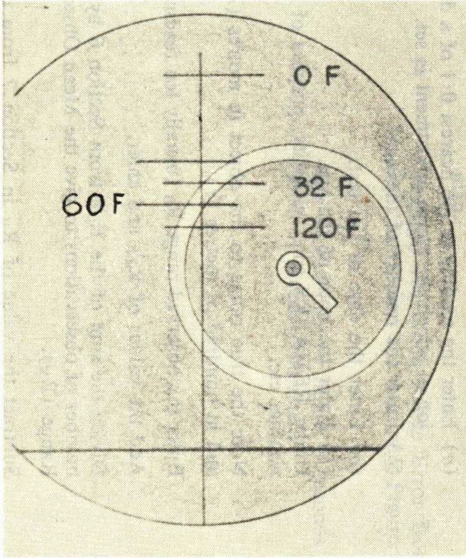

0 F
32 F
60F
120 F

FIGURE 35—Marker seen in optical lath when boresighting

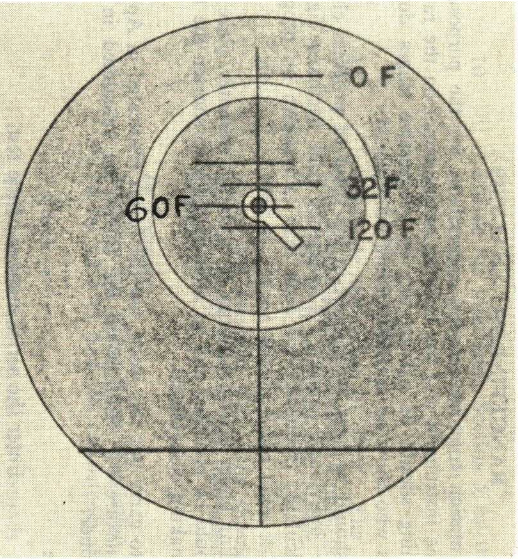

0 F
32 F
60F
120 F

FIGURE 36—Position of marker in optical lath when correctly boresighted

APPENDIX "A"

RANGEFINDING ANALYSIS

1. The information contained in this appendix is for the purpose of field testing the instrument and the training of personnel on the rangefinder. Training should be carried out by progressive stages during which soldiers who show no aptitude should be replaced.

2. Records should be kept throughout in the form of progress charts to assess the individual's ability. Consistency and accuracy figures should be calculated frequently for each man and shown on progress charts.

3. Rangefinding under poor conditions of visibility, shimmer, glare and high wind should be practised and an attempt made to shorten the time taken when making coincidence.

4. In order to carry out this work, use the forms illustrated in Appendix "A"—Annexure—1. Entries on the forms are calculated in the following manner:

Section	*Entry*
1	Enter the serial number of the test.
2	(*a*) Enter the reading to the nearest 0·1 of a division at which the range adjustment is set. (*b*) Enter the number of the sight.
3	(*a*) Enter the date of the test. (*b*) Enter the hour of the test. Under REMARKS enter visibility, purpose of test, weather etc.
4	Note the true range to the object in metres (RT) and in hundred of metres (r).
5	Enter the observed range R_0 (usually ten readings).
6	Add the values of R_0's and enter.
7	Divide the sum of the R_0's from Section 6 by the number of observations to give the Mean Observed Range (R_M).
8	Subtract the value of R_M in Section 7 from each value of R_O in Sections 5 to give the Range Deviations ($R_O - R_M$) record neglecting whether plus or minus.

Section	*Entry*
9	Add together the values of $R_O - R_M$ in Section 8.
10	Divide the total from Section 9 by the number of observations to give the Mean Range Deviation in metres.
	In Field Training
11	Calculate the value of $r^2/2$. The Mean Range Deviation found in Section 10 must not exceed this if the test is to be considered reliable.
12	Find the Mean Range Error from R_M (Section 7) minus RT (Section 4). This should not exceed plus or minus $r^2/3$ if the instrument is properly adjusted.
	In Training
13	Multiply the Mean Range Deviation from Section 10 by 23·6 to find the consistency Figure. —— r^2 This should not exceed 12 seconds for a trained man.
14	Multiply the Mean Range Error from Section 12 by 23·6 to find the Accuracy Figure. This should —— r^2 not exceed plus or minus 8 seconds if the instrument is properly adjusted.

APPENDIX "A" ANNEXURE 1

RANGEFINDING ANALYSIS

9-INCH RANGEFINDER SIGHT

1. Serial =	2. Reading on Range Adjustment = −1·5 Sight No = 16	3. Date = 4 Feb 55 Hour = 1530 Remarks Overcast, Light Snow
4. True Range (R_T) (metres)	5. Observed Ranges (R_O) (metres)	8. Range Deviation (R_O—R_M) (metres)
$R_T = 200$	199	0·7
	202	2·3
	202	2·3
$r = \frac{RT}{100}$	199	0·7
	199	0·7
	201	1·3
$r = 2$	198	1·7
	202	2·3
	197	2·7
	198	1·7
6. Sum of R_O =	1997	9. Total = 16·4
7. Mean Observed Range (R_O) $= \frac{\text{Sum of } R_O}{\text{Number of Observations}}$ $= 1·99$ metres		10. Mean Range Deviation $= \frac{\text{Total of Range Deviations}}{\text{Number of Observations}}$ $= 1·64$ metres

FIELD TESTING OF INSTRUMENT

11. The Mean Range Deviation above should not be more than.

$r^2/2 = 4/2 = 2$
if the test is reliable

12. Mean Range Error (R_M—R_T)
$(199 \cdot 7 - 200) = -0 \cdot 3$
and this should not exceed
$= r^2/3 = 4/3 = \pm 1 \cdot 3$
if the instrument is in adjustment

FOR TRAINING PURPOSES

13. Consistency Figure

$$= \text{Mean Range Deviation x } \frac{23.6}{r^2}$$

$$= 1 \cdot 64 \text{ x } \frac{23 \cdot 6}{4}$$

$= 9 \cdot 7$ seconds
This should not exceed 12 seconds for a trained man if the test is to be considered reliable

14. Accuracy Figure

$$= \text{Mean Range Error x } \frac{23 \cdot 6}{r^2}$$

$$= -0.3 \text{ x } \frac{23 \cdot 6}{4}$$

$= -1 \cdot 8$ seconds
This should not exceed ± 8 seconds if the instrument is properly adjusted

---

Note: When the rangefinder is being tested on infinity, R should be noted as the number of divisions, to the nearest 0·1 of a division of the range scale or of the infinity mark on that scale. Then

in Sec. 11 the Mean Range Deviation should not exceed 2·4 divisions,
in Sec. 12 the Mean Range Error should not exceed 1·5 divisions,
in Sec. 13 the Consistency Figure will be the Mean Range Deviation x 5,
in Sec. 14 the Accuracy Figure will be the Mean Range Error x 5,

since one division is equal to 5 seconds of arc.

APPENDIX "B"

TESTS OF ELEMENTARY TRAINING

Test No 1—Loading

1. The launcher will be held by an assistant and supported in a steady position. Time allowed is 20 seconds from the command "LOAD" until the loader taps the firer and calls "READY".

2. Standard: All actions must be correct and within the required time limit. This test is done three times.

Test No 2—Actions on Misfire

3. Both firer and loader must go through the complete misfire drill.

4. Firer and loader will be alternated in order to be tested in both duties.

5. Standard: All actions must be correct.

Test No 3—Aiming

6. The soldier will be given three problems involving aiming at moving targets. He will be required to place a transparent model of the reticle pattern over a photograph of a tank taken outdoors and representing a likely tactical situation.

7. Standard: All aims to be correct.

Test No 4—Making Coincidence

8. The soldier will be required to adjust a rangefinder which has purposely been set out of adjustment and then to take ten readings on a known range between 200 and 500 metres on a well defined object.

9. Standard: A consistency figure not more than 12 seconds and an accuracy figure less than 8 seconds determined in Appendix "A".

Test No 5—Boresighting

10. The soldier will be required to boresight using either the optical lath or optical boresight on to a given temperature.

11. Standard: All actions and setting to be correct.

APPENDIX "C"

LAUNCHER ANTI-TANK 3·2-INCH RANGE AND SAFETY PRECAUTIONS

General

1. Any reasonably level ground, where the standard danger area can be obtained, is suitable for the construction of a Range.

2. The launcher may be fired from any of the normal firing positions. HE A tk projectile may be fired only from behind blast proof cover large enough to protect the firer, loader and instructor, the thickness of the cover should not be less than the equivalent of 20 inches of sand.

3. The most suitable target is an old AFV. If this is not available, targets may be constructed of logs, armour plate or solid wooden frames or, for practice shots only, hessian-covered frames.

Danger Area

4. The danger area required for the 3·2-inch anti-tank launcher, firing HE A tk projectiles will be sufficiently large to allow for a "danger burst" or "fragmentation area" of 300 yards radius all round the impact area and in rear of the firing point.

5. Impact area: The length of the impact area will remain constant, from 100 yards (the minimum range at which a target may be engaged) to 2,860 yards (maximum range of the projectile), whereas the width will vary according to whether the target is stationary or moving as follows:

(*a*) Stationary target—The impact area will extend 10 degrees to both sides of the target area. On a range with a single line of fire this will be 10 degrees both sides of the range axis.

(*b*) Moving target—The impact area will extend to 20 degrees both sides of the target area.

6. Target area: The length of the target area will be the same as that of the impact area. The width of the target area will be decided by the arc of fire required. This will depend on the area of land available. For a stationary target area, the arc of fire will thus be 20 degrees less and for a moving target area 40 degrees less than the arcs of the respective impact area.

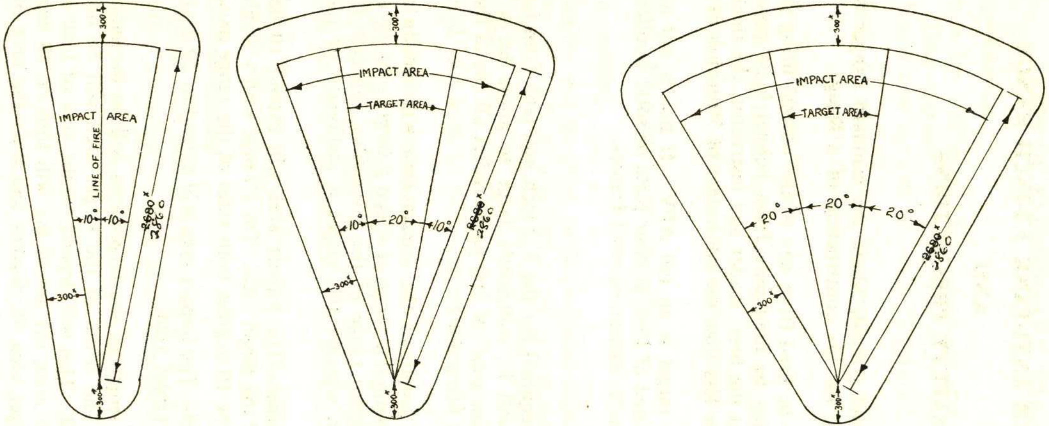

300x
IMPACT AREA
LINE OF FIRE
10°
10°
2680x
2860
300x
300x
300x
IMPACT AREA
TARGET AREA
10°
20°
10°
2680x
2860
300x
300x
300x
IMPACT AREA
TARGET AREA
20°
20°
20°
2680x
2860
300x
300x

FIGURE 37—3·2-inch launcher anti-tank danger area

(*a*) for single line of fire at a stationary target
(*b*) for an arc of fire
(*c*) for moving targets

7. (*a*) The danger area template for a range with a single line of fire at a stationary target, is illustrated on Fig 37 (a).

(*b*) When an arc of fire for stationary targets is required, the total danger area will be determined by applying the above template (Fig 37 (a)) with the centre line along the flank lines of the target area. The extremities will then be joined up, giving a resultant danger area, as illustrated in Fig 37 (b).

(*c*) For moving targets the arc of the impact area is increased to 20 degrees outside each ffank of the target area, the template being applied in a similar manner to (*b*) above. The resultant danger area, with an arc of fire, is illustrated in Fig 37 (*c*).

8. The boundary of the danger area should be clearly marked on the ground by danger notice boards at regular intervals as decided by the Board of Officers reporting on the range, and as required by CAMT 7-41.

9. The oblique limits of fire should be delineated on the ground by tall posts, with a distinguishing letter X or O on the top.

Danger Area Practice Projectiles

10. The danger area required for firing practice projectiles at stationary or moving targets will be the same or for the HE A tk projectiles. except that the 300 yards for "danger bursts" or "fragmentation area" is not required. See Fig 37a for single line of fire, stationary target.

11. All safety precautions as laid down in paras 18, 19, 20, 21, 22 and 23 will be observed.

Moving Target Ranges

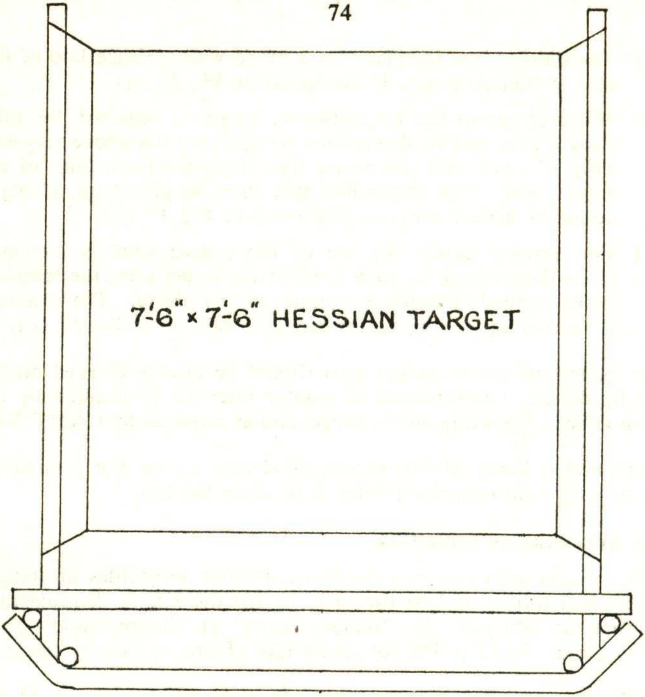
12. The construction of a moving target range for firing HE A tk projectiles would prove a very expensive project, and therefore, firing at moving targets will normally be carried out with practice projectiles.

13. A simple arrangement for firing practice shots as a moving target is shown on Figs 37b and 37c.

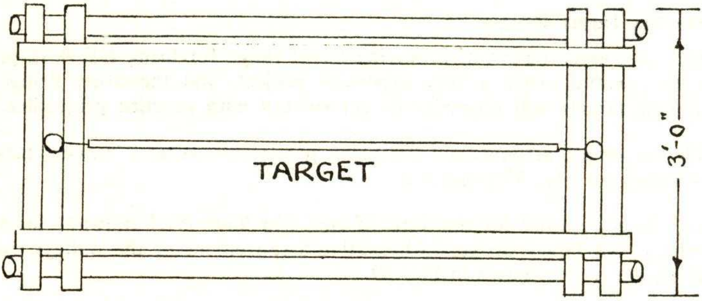
14. It is essential for this type of range to have level runways for the vehicle and target sledge. Alternative arrangement of the pulleys, runways, etc is also shown in Fig. 39.

15. The sledge may be constructed of tubular scaffolding or timber.

16. For firing HE A tk projectiles on a moving target range, all personnel inside the danger area must take adequate protective cover.


7'-6" × 7'-6" HESSIAN TARGET

FRONT VIEW



PLAN

FIGURE 38—Target sledge for moving target range 3·2-inch launcher anti tank

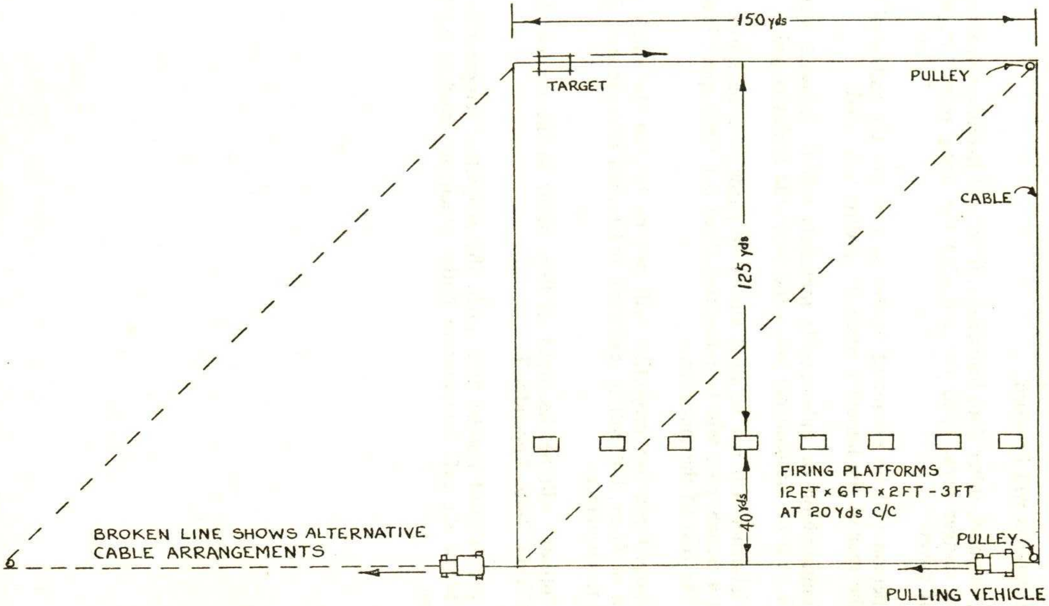

150 yds
TARGET
PULLEY
CABLE
125 yds
FIRING PLATFORMS
12 FT × 6 FT × 2 FT - 3 FT
AT 20 Yds C/C
40 Yds
PULLEY
PULLING VEHICLE
BROKEN LINE SHOWS ALTERNATIVE
CABLE ARRANGEMENTS

FIGURE 39—Layout of moving target range for 3·2-inch launcher anti tank

Safety Precautions

17. Steel helmets will be worn.

18. All personnel, other than instructors, firers and loaders, will remain outside the danger area, (300 yards behind the firing point) or take blast proof cover.

19. No person will be permitted in the area within the radius of 40 yards to the rear of the launcher when the projectile is fired.

20. No ammunition or inflammable materials will be allowed within 50 yards in rear of the launcher when the projectile is discharged.

21. The launcher will not be fired within 40 yards of a backstop. If fired from a trench, care will be taken that there is a clear space immediately to the rear of the launcher.

22. Discharged practice projectiles will not be left on the range on completion of firing, but will be gathered and turned into the unit QM for return to Ordnance.

23. All "blinds" will be destroyed as they occur in the manner laid down in CAMT 7-40. Appendix T.

24. The rocket must not be fired when the propellant temperature is above or below the safe temperature limits which are marked on the motor tube.

RESTRICTED

EDMOND CLOUTIER, C.M.G., O.A., D.S.P.
QUEEN'S PRINTER AND CONTROLLER OF STATIONERY
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